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CONTENTS

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

Early G.W.R. Chairman Commemorated

IN honour of the memory of Charles Russell, one of its early Chairmen, the G.W.R. has given the name *Swallowfield Park* to its "Star" class locomotive No. 4007 (previously *Rising Star*), as Swallowfield Park, Reading, was the home of Charles Russell and is still occupied by the family. The park was a royal domain at the time of the Norman Conquest and the present building was constructed in 1678 by Henry, second Earl of Clarendon. In the dining room the three famous figures associated with the early history of the company—Russell, Brunel, and Gooch—used to meet to discuss the business of the railway. Charles Russell was largely instrumental in fighting the Great Western Railway Bill through the House of Commons in 1835. He was Chairman of the company for the sixteen years (1839-1855) during which were laid the foundations of the Great Western Railway system of today, but he was the third Chairman, and not the first as has been stated. Russell was held in such great esteem by the staff that £420 was collected for a full length portrait which was presented to him as a testimonial to his high principles of honour, impartiality, and undeviating kindness. This portrait still hangs in the board room at Paddington, and in the old days anyone up for reprimand was said to be "going to see the picture." Incidentally, the name *Charles Russell* was originally borne by the famous 8-ft. single broad-gauge engine *Lord of the Isles*, which was built at Swindon in 1850, shown at the Great Exhibition of the following year, and in the next 32 years ran 789,300 miles with its original boiler.

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A Railway Occasion

Noting the undivided absorption of youth in things mechanical, a railway chairman may be excused for thinking twice before revealing himself to such an audience as the mere mortal behind the deified machine. Mr. William Whitelaw, Chairman of the L.N.E.R., braved the risks at New Barnet on June 5, when his genial and humorous survey of the exhibits at a display of the latest L.N.E.R. locomotives and rolling stock, was heard with an attention unlooked-for among those who a few minutes before had been joyously tweaking the whistles of *Arsenal* and *Golden Eagle*. Mr. Whitelaw, in calling upon Sir Philip Sassoon to declare the exhibition open, found a useful moral for his audience in the fact that the forthcoming L.N.E.R. six-hour runs to Edinburgh will be achieved not merely by high speed where the going is easy, but by sustained effort uphill. With that thought, he consigned his hearers to sample the varied entertainments which railway ingenuity had provided for them. Special reference was made by speakers at the opening ceremony to the work of Mr. A. J. Brickwell, formerly Estate and Rating Surveyor, L.N.E.R., in organising the exhibition on behalf of local and railway staff charities. An illustration of Mr. Whitelaw at Barnet appears on page 1122.

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The Week's Traffics

There is general satisfaction with the traffic returns of the four main line companies for the past week. They are exceptionally good seeing that they compare with those of a week in 1936 which included the Whitsuntide bank holiday. The Great Western and the Southern have gains even on the passenger side, and the goods and coal receipts are substantially up in every instance, with the result that the total increase in the traffics of the four companies for the week is £514,000, and the percentage increases to date have all materially improved. For the 22 weeks of 1937 the aggregate receipts amount to £65,078,000, an increase of £2,884,000, or 4·64 per cent.

	22nd Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	− 19,000	+114,000	+91,000	+186,000	+1,138,000	+ 4·49
L.N.E.R. ..	− 30,000	+ 91,000	+98,000	+159,000	+ 910,000	+ 4·91
G.W.R. ..	+ 2,000	+ 56,000	+58,000	+116,000	+ 531,000	+ 5·14
S.R. ..	+ 21,000	+ 17,000	+15,000	+ 53,000	+ 305,000	+ 3·81

The London Transport receipts for the past week amounted to £584,500, a decrease of £7,100 on the corresponding week last year. For the 49 weeks to date the total is £27,022,400, an improvement of £246,700.

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Wagons-Lits Results

The level of traffic worked by the International Sleeping Car Company diminished slightly during the first half of 1936, but gradually improved in the course of the summer and noticeably in the last quarter of the year, and at Christmas the number of special trains and supplementary cars in service was greatly in excess of recent years. On the other hand, the price of commodities and the introduction of social legislation, particularly in France, has greatly raised the level of expenditure. Dividends on the

company's holding in Thomas Cook & Son Ltd. increased from £25,000 to £50,000. The Nord Express has been extended from Warsaw to the Russian frontier, with new connections to and from Moscow. Further progress is being made in the Far East, and negotiations are proceeding with the Chinese administrations to increase the number of the company's services. During the year the contract with the Finnish State Railways has been renewed.

	1936 Belgian francs	1935 Belgian francs
Profit on working	84,960,507	87,668,552
Dividends and profit on redemption of sterling issues	11,443,768	16,225,368
Total income	96,404,275	103,893,920
Interest and other charges	60,632,530	72,458,760
Balance	35,771,745	31,435,160
Brought forward	131,716	146,556
Rolling stock amortisation	35,800,000	31,450,000
Carried forward	103,461	131,716

The night ferry service between Paris and London has shown continuous success since its inauguration on October 14, 1936.

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Great Southern of Spain Railway

The directors report that control of the railway was assumed on September 5, 1936, by the local railway workers' council with the indulgence of the State representative. Subsequently a decree of December 26, 1936, enacted that the State should take charge provisionally of the working of the railways not comprehended in an earlier Decree of August 3, 1936. Protests against the seizure of the undertaking were lodged with the Government authorities by His Majesty's Chargé d'Affaires, and also by the company's representative in Madrid, and at the proper time the company will formulate its claim against the Spanish Government. As the archives and books were seized by the workers' council no accounts are available from Spain for the year ended December 31, 1936. Taking into account only the revenue and expenditure in London, including first mortgage debenture interest accrued but payment postponed under moratorium scheme as extended in May, 1936, the loss for the year is £12,516. Adding this to the debit balance brought forward of £122,253, the accumulated debit balance on net revenue account to be carried forward amounts, as far as it is ascertainable, to £134,769. No remuneration has been received by the directors in respect of the year 1936. In 1935 the gross receipts amounted to £83,617, and the working expenses to £108,946. During the earlier part of 1936 before the civil war broke out there were strikes at intervals due to the Government's delays in paying the advances promised to meet wage increases and legislative burdens.

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British Ambassador's Tribute to Chinese Railways

In the current issue of the *Quarterly Review of Chinese Railways*, reviewed on page 1103, the introductory article entitled "An Appreciation of Railways in China" is contributed by Sir Hughe Knatchbull Huggesen, H.B.M.'s Ambassador to China. This article is welcome as expressing the views of so distinguished a Minister, especially as it so warmly applauds the "truly impressive" reforms already introduced and remarkable progress now being made under the present enterprising administration in Nanking, and also because it encourages investors to increased confidence in Chinese railways. Sir Hughe shows his grasp of the situation by his conviction that the problem of transport is at the root of the question of economic development of this vast country. But although China is blessed with numerous navigable waterways, he points out that these can serve only a small fraction of her territory, and he looks to railway expansion —thousands of miles of which are urgently required—to open up the whole country. After expressing his pride in the large share British finance and engineering have had in creating existing railways in China, he hopes that they will play an equally important part in future construction, a sentiment we cordially endorse. Then follows his tribute to the reforms and progress under the able administrations both at the Ministry of Railways and throughout the country, developments which are not only benefiting the public, but also engendering in investors increased confidence and encouraging investment in future railway construction. We join with Sir Hughe in expressing "heartfelt good wishes to this excellent work."

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Success of L.M.S.R. Mobile Instructional Cinema

Last November the L.M.S.R. staff instructional travelling cinema—claimed to be the first of its kind to incorporate a full-size projector—set out on an eight-months' tour of the system in order to bring knowledge of new developments to places where hitherto the only information had been hearsay. This tour will shortly come to a conclusion and up to the present time 450 performances have been given at 68 stations and goods depots to audiences totalling over 12,000 railwaymen. So successful has this unit been in fufilling its function that it has been decided to build another, and this will be placed in service in the autumn. The purpose of the films shown was to instruct without arousing any feeling of resistance in the minds of the audience, and they were planned on the assumption that the screen can teach its lesson most effectively by showing the railwayman the comparison in results between his doing his particular job in the right and in the wrong way.

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Relocation to Avoid Flood Damage

The flooding of the Ohio and Mississippi River valleys in the U.S.A. early this year was but an exceptionally serious example of what is a perennial threat to railways in some parts of that country. In places where the Southern Pacific Sunset Route from New Orleans to the West Coast parallels the Rio Grande, flood damage has been suffered at intervals ever since this part of the line was completed in 1883. Minor changes of location to avoid this trouble were carried out in the early days, but extensive works were not begun until 1925-6, following severe dislocation of traffic by floods. Again, in 1935, brief interruptions of service in May, June, and July culminated in the line being broken for 11 days in September. Four more relocations were therefore undertaken at once in the Thurston and Sanderson canyons, between the stations of Sanderson and Del Rio. Together, these have totalled 13·61 miles of new line, planned to reduce as far as possible the numerous crossings of creeks made by the old line, and to follow higher ground, above the flood level. These relocations, completed in 1936, add little over half a mile to the distance of the original route; and as the new works of 1925-6 saved 4½ miles, the railway is on the right side both in distance and reduced liability to flood damage.

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Railway-Owned Airways

At the third annual meeting of Railway Air Services Limited, held at Euston on May 28, the Chairman, Sir Harold Hartley, stated that the company had now operated air services continuously for three years and had reached a stage where its operations made good showing judged by the requirements of the Maybury Committee.

Railway Air Services had built up a network of routes and an organisation which could claim to have played an important part in the development of internal civil aviation in this country. The air transport activities of British railways in 1936 are reviewed on page 1130. The total figures reveal some improvements in the position compared with 1935, the net loss having decreased by £2,257 to £40,942. The development of routes over the sea has shown considerable promise and it is highly probable that in the absence of any striking changes in technique this will prove the most fruitful field for commercial air transport in the future. Progress is being made with accommodation at aerodromes, and navigation facilities will be considerably improved when effect is given to the recommendations of the Maybury Committee. The winter off-peak remains a serious handicap to economic operation, but during 1936 the falling off of traffic on the routes which are operated throughout the year has been less marked than before.

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Railcar Internationalism

International service of a remarkably extensive description is now being rendered by the Danish diesel-electric unit known as Nordpilen, which daily runs the whole length of Jutland in each direction between Friederikshavn in the north and Flensburg on the German frontier. From the port of Friederikshavn steamer services are run across the Kattegat to Gothenburg and back daily, with express connections by the electrified main line of the Swedish State Railways to and from Stockholm, and the Nordpilen is in direct connection with these steamers. On alternate days there is a steamer service, during July and August, between Friederikshavn and Oslo, in connection with the railcar unit. A stop of the latter at Hjorring enables connection to be made with Hirtshals, whence a steamer service is to be established across the Skagerak to Kristiansand, an important city of Southern Norway. Another stop, at Kolding, intercepts the east-west run of Englaenderen, the new four-car Copenhagen—Esbjerg unit, so giving direct communication with the capital, on the east, and England, on the west. Finally, at Flensburg, Nordpilen is in connection with fast German rail services to and from Hamburg and beyond, and thus links up Germany, Sweden, Norway, and, indirectly, England, on this one run through the mainland of Denmark. Other new Lyntog diesel-electric services in Denmark, as described in our Overseas notes on page 1105, give every important city in Denmark fast communication with the capital twice daily in each direction, morning and evening.

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Hayes Sleeper Depot

The Hayes sleeper depot of the G.W.R., about 11 miles from Paddington, is such a widely-known and justly-famed establishment that many will be interested to learn of its 60th birthday today. Prior to the formation of this depot, a sleeper and stacking ground was in use at Chelsea basin, but it was decided that the new yard should comprise a fully equipped creosoting works, and that the drying and pickling should be carried out there, which would ensure the finished timber conforming in every respect with the required standard. In 1875 a start was made to clear and level the site, and this preliminary work embraced the construction of a wharf on the canal side, entailing the provision of a "lay by" to permit barges lying alongside without interfering with the normal width of waterway, and a siding from Hayes station to the yard, located on natural ground-level at the foot of the railway embankment. One cylinder, an oil tank, with vacuum and force pumps, were the only plant then provided. In our Scrap Heap columns this week (page 1104) we reproduce a copy of the train notice announcing the running of the first sleeper trains from Chelsea basin to Hayes yard on June 11, 1877. The stock transferred from Chelsea consisted of about 80,000 pieces, and when this was exhausted new contracts were made for clean timber, of which delivery in barges was made at the wharf. The work of unloading, stacking, creosoting, and so forth, was at first undertaken by a contractor with a gang of 15 men, but in 1884 this was taken over by the G.W.R. itself. The new and up-to-date 21½-acre depot, which in 1935 replaced the original 11-acre establishment, was described and illustrated in THE RAILWAY GAZETTE of December 6, 1935.

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An L.M.S.R. Painting Achievement

The problems confronting a railway paint technologist are various, since they comprise the painting of ships, locomotives, passenger and goods vehicles, stations, bridges, road motor vehicles, signals, and hotels. All these present their own special problems, but the most difficult of all is undoubtedly the finishing of railway carriages. For such stock a motorcar finish is required, but unlike the car, which is garaged when not in use and carefully cleaned by a devoted owner, the railway carriage is often parked on exposed sidings and becomes covered with all the traffic film that passage through tunnels and smoke-laden atmospheres can produce. Between these periods, and while it is in service it is not practicable to clean it with the meticulous care which the motorcar receives. Consequently, due to the varying conditions, and to the type of traffic film which the paintwork accumulates, much more drastic cleaning operations are necessary. The L.M.S.R. Research Department has now made a useful contribution to the maintenance of smartness by developing a special pigmented or clear varnish finish capable of withstanding the drastic cleaning processes which such conditions impose. For the particulars of this process which we publish on page 1117 this week, we are indebted to Mr. T. M. Herbert, Research Manager, L.M.S.R.

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Steam *versus* Diesel in the U.S.A.

For comparative purposes, the Chicago, Burlington & Quincy Railroad has recently introduced a 4-6-4 type streamlined locomotive to serve as a relief for the Zephyr diesel-driven trains running in the regular high-speed passenger service between Chicago and Denver, and between Chicago and the Twin Cities; the step is of interest as forming a basis for noting the relative performance of each type of motive power under identical service conditions. The engine has been converted from one of the existing standard type with booster, and now incorporates certain important changes in running gear details, in addition to which extensive use is made of roller bearings in the construction. A second locomotive of a similar kind but new throughout will be built. The first locomotive has been named *Æolus*, and is expected to be able to maintain the Zephyr 16-hour schedule over the 1,034 miles between Chicago and Denver without extending itself, and with only two stops for refuelling and six for water, most of the latter coincident with regularly scheduled station stops. The locomotive, which is said to be capable of speeds well over 100 m.p.h., is intended primarily to meet the demands for everyday high-speed passenger service, and only occasionally for relieving the Zephyr.

The Transport System of Ceylon

ELSEWHERE in this issue we give a summary of the very interesting report by the commission—of which Brigadier-General F. D. Hammond, C.B.E., D.S.O., was Chairman, Mr. J. D. C. Couper, C.B.E., Member, and Mr. J. F. M. Taylor, Secretary—appointed by the Secretary of State for the Colonies to report on the administration and control of railway and road transport in Ceylon. This is an exceptional report, as, apart from the clear and methodical way in which it has been prepared (and may we pay the authors a compliment on their English?) it covers new ground in that not only does it indicate the principles upon which road and rail transport should be organised and co-ordinated, but it also gives in great detail the precise methods which are required. The physical characteristics of Ceylon—the area of which island is a little smaller than that of Ireland—have a predominant bearing on its transport problem. A large part of the population (5½ millions) is concentrated in the southern half of the island, in which part there is a mountainous region where the railway rises to a height of over 6,000 ft. Distances are short, and there is considerable contrast between the density of traffic in one part of the island as compared with the other.

It is a sorry tale that the commission has to tell of the present state of affairs. Road transport is run under almost entirely uncontrolled conditions—even the existing inadequate legislation is not properly enforced—and the railway working expenses have exceeded the gross receipts for some years. The Government is, of course, responsible for the existing conditions so far as road transport is concerned, and to a large extent in the case of the railway, in that, for example, the renewals fund balance has been appropriated, schemes for improvement in methods have not been accepted, and high rates of pay and unnecessarily generous conditions of service for the staff have been permitted. In addition, however, the commission finds that considerable improvements in methods and organisation can be made so far as the technical operation of the railway is concerned. The commission was, therefore, faced with the task of reporting in detail, as well as in principle, as to what is required to enable both road and rail transport to operate with efficiency and without wasteful competition. In the case of the road a central authority is recommended, together with new and altered legislation, and increased police supervision; careful wording is used to define the principles upon which the central authority should work so as to make the best use of existing facilities in the public interest. The detailed proposals are of very great interest, and are worthy of study not only from the point of view of their application in Ceylon, but elsewhere. As to the railway, the commission has recommended the complete separation of the railway from the Government; the creation of a Railway Board; the reorganisation of the railway internally, including the continuance of the divisional system in a more adequate form; the adoption of many modern methods of operation; and the introduction of an adequately organised Commercial Department. The sections of the report dealing with the financial relations between the Government and the railway are of exceptional interest, and the adverse effect on railway efficiency of the existing relations in this respect between the Government and the railway are commented on.

Two comparatively minor, though interesting, recommendations may be noted. The first is that the Chief Commercial Officer of the railway—a new appointment—should be recruited from the commercial community in Ceylon. There is no doubt that commercial work has been neglected on railways all over the world until recent years, and the colonial lines are no exceptions. Whilst, in Ceylon, it may be right to recruit the Chief Commercial Officer from the local commercial community, in other Colonies where conditions are different, such as Nigeria, a member of the Civil Service or Political Department might be more suitable. At any rate there is no doubt of the soundness of the proposal. The second recommendation referred to is that Ceylonese officers should serve on other railways in the Crown Colonies so as to give them wider experience. This proposal will raise controversy, but we feel that, subject to consideration from a local aspect, the proposal is on the right lines. The whole of the proposals and recommendations in the report of the commission raise a question of Imperial administration. Apart from consideration of their adoption in Ceylon itself, how are they to be discussed and applied singly or wholly on other colonial railways, in Nigeria, Tanganyika, Kenya, and the Federated Malay States, to mention the more important? Is it not opportune to suggest that some machinery—conferences of railway officers on leave and such like—should be set up by the Colonial Office to enable discussion to take place and decisions to be made about many of the interesting suggestions in the report under notice, and in annual and other reports of railway administrations, not only from the point of view of their application to one colonial line but to others?

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Training for Signal and Telegraph Maintenance

THE changes of the last thirty years or so in railway signalling are nowhere more plainly indicated than in the modifications it has been necessary to make on some lines in maintenance methods and the training of those entrusted with them. The old fashioned signal installations, as we suppose we may term them, although we shall not see the last of them for a very long time yet, cannot claim to stand on the same level of engineering achievement as most more modern equipment, notwithstanding the ingenuity which has at times been bestowed on them. They do, however, require specialised knowledge to instal in the first place, and to maintain efficiently afterwards. Such knowledge was gained by practical experience alone in former days, when much of the work was in the hands of contractors, to whom the railways owe much for what they did in the development of reliable signalling apparatus; not a few of the most skilled men employed by these contractors ultimately joined the railway staffs. In those days there were practically no facilities for systematic instruction and training; probably but few engineers even thought they could be usefully introduced. Here and there something of the kind was attempted on modest lines by a few enthusiastic individuals, such as inspectors, and a course of mechanical signal engineering was, we believe, professed at one technical college a few years before the war, but what attendance it commanded is unknown to us.

The telegraph maintenance man was in a more fortunate position, as he could learn much of the fundamental principles of his work and the construction of apparatus at many technical schools—if he could get to them—but even then the special requirements of railway maintenance work were scarcely touched on. The introduction of power and automatic signalling, and such things as selective and automatic telephones and high-speed printing telegraphs, gradually increased the amount of delicate apparatus to be attended to, quite transforming the work of the signal and telegraph department in the course of

time. The training of maintenance staff has similarly grown in importance, and several railways, both in this country and abroad, have been led to institute organised means to that end. In his paper before the York meeting of the Institution of Railway Signal Engineers on April 14, Mr. J. H. Fraser, Assistant Signal and Telegraph Engineer, North Eastern Area, L.N.E.R., dealt with the training organisation which has been in existence there for some time, with very satisfactory results, due as much to the keenness of those who learn as to the trouble taken by those who teach. This organisation is aided by a well-equipped school and mobile instruction van, and the latter is found extremely useful in the outlying districts. The Southern Area also possesses such a van, which has done good work, and many lines abroad have adopted the plan. Incidentally these vans have been found to possess considerable advertising value, always attracting numbers of visitors when opened to public inspection, and serving to impress on them the care taken by the railways to ensure the safety of their clients. There are apprentice training schemes and educational facilities to be found on other railways, and the London Passenger Transport Board has a well-equipped training school at South Kensington. Others will probably come into existence in due course, and the information in Mr. Fraser's paper should be very helpful to any company contemplating the step.

The changed circumstances of recent years and the placing of all signal engineering work, in the broadest sense of that term, under one responsible officer, as is now general in Great Britain, has led to the introduction of combined maintenance, in which men are expected to have much more all round capabilities than formerly, and to be able to attend to mechanical or electrical devices with equal efficiency. This is found particularly advantageous where they have to go some distance to rectify a fault or inspect apparatus, and must spend some time at a distant station before they can get a train to take them elsewhere. One man can profitably use the time in attending to whatever is necessary, whereas it is distinctly wasteful of time—and therefore money—for two or more men to go, each with his own limited field of work. It is for this reason that in the Irish Free State the signal department has taken over the work of maintaining certain outdoor machinery. Nevertheless there are circumstances in which the separate system is still found the more suitable, as on some heavily worked sections of line, with signal boxes, or signal locations, at frequent intervals, and a large amount of apparatus of various kinds to keep in order. Even with that arrangement, however, a general knowledge of most of the appliances in use is very valuable to a man, whatever class of work he may be entrusted with for the time being.

Specialisation of functions is necess ry in modern industry, off or on the railway, but it does a man no harm, but a great deal of good, if his training has been broad enough to give him an interest in, and understanding of, many things beyond his immediate sphere of activity. For this reason, if no other, a thorough all round educational and training scheme for the signal and telegraph maintenance staff must be a valuable thing and cannot fail to be productive of good results. Mr. Fraser's paper came at an opportune moment, in advance of the discussion on the subject at the International Railway Congress; the reports prepared for the latter showed considerable diversity of practice and opinion, especially among the Continental lines. All railways are having to consider the general question of training for the service much more than formerly, and the signal and telegraph maintenance question is thus only part—though a very important part—of a wider problem.

Records

THERE are some encouraging features of progress about the British timetable changes, reviewed on page 1131 of this issue, which are to come into force on July 5. To not a few of them the much-abused description of "record" may be applied with propriety. Foremost among the innovations, of course, are the new high-speed trains between London and Scotland. The L.N.E.R. Coronation will cover the 392·7 miles between King's Cross and Edinburgh in 6 hr. each way daily—a time 75 min. less than the quickest time previously tabled, and 19 min. less than the fastest time ever yet made between the two cities, which was 6 hr. 19 min., in the "Race to Aberdeen" of 1895. Furthermore, by covering the 188·2 miles from King's Cross to York in 157 min., the down Coronation will wrest from the G.W.R. the blue riband of British speed, which the latter has held since the autumn of 1932, with a start-to-stop average of 71·9 m.p.h. as compared with 71·4 m.p.h. Actually the timing of the Coronation is identical with that of the Silver Jubilee, between London and York, but the stop at York raises the mean start-to-stop speed by cutting out the reduced speed imposed on this high-speed train north of York. The L.M.S.R. Coronation Scot, with a time of 6½ hr. over the 401·4 miles between Euston, will cut 55 min. below the fastest scheduled time yet known between London and Glasgow. Its 63·4 m.p.h. schedule over the 299·1 miles between Euston and Carlisle will also be the fastest in the world over so great a distance non-stop, though closely approached in length and beaten in speed by the up journey of the L.N.E.R. Coronation, non-stop from Newcastle to King's Cross, 268·3 miles at 67·9 m.p.h.

The reorganisation of the L.M.S.R. afternoon services between London and Scotland, consequent upon the introduction of the Coronation Scot, offers a striking example of the way in which, so far from a high-speed path affecting other services adversely, the latter are very considerably improved. By means of new connections with the Midday Scot, which will still continue to run, Liverpool is brought within 4 hr. 40 min. of Edinburgh—the quickest time on record—and accelerations ranging between 26 and 53 min. are achieved between Liverpool and Manchester, on the one hand, and Edinburgh and Glasgow, on the other. In the up direction, by connecting the 12.20 p.m. from Perth with the Midday Scot at Law Junction, an acceleration of 70 min. is achieved from Perth and Stirling to Euston; the afternoon service from Barrow is also fed into the Midday Scot at Lancaster, and a quickening of 56 min. to Euston is thereby effected. Apart from the introduction of the Coronation, the L.N.E.R. creates a new record by cutting the time of the non-stop Flying Scotsman to 7 hr. between King's Cross and Edinburgh—15 min. less than last summer and 75 min. less than when the non-stop run was first introduced in 1928. With the aid of a 3-hr. connection from Edinburgh to Aberdeen, the Granite City is reached in 10¼ hr. from King's Cross, but this is beaten by the Aberdeen connection to the southbound Coronation, which, inclusive of 20 min. wait at Edinburgh, offers a 9¾-hr. service from Aberdeen to London. Were the 12.45 from Aberdeen reduced to a 3 hr. timing to Edinburgh, it would be possible to travel from Aberdeen to London in 9¼ hr., or just over, though even this would still be 35 min. longer than the quickest time of the 1895 "Race to Aberdeen"—a feat of speed which, with all allowance for the light weight of the train that achieved it, is yet but imperfectly appreciated in relation to the locomotive power available 42 years ago.

Another timetable improvement of July is one which

witnesses to the possibilities of grouping in providing faster services. When the Heysham-Belfast steamer service was inaugurated by the then Midland Railway, the connecting train had to travel a distance of 267¾ miles in order to follow Midland metals from St. Pancras to Heysham. Now that the starting-point of the Ulster express has been transferred to Euston, and the route to the ex-L. & N.W. main line, the distance from London to Heysham has been reduced by 30 miles, and the climax of improvement of the service is to be reached in July by running the boat express non-stop over the 234 miles between Euston and Morecambe. It is not merely to give improved service to a popular coastal resort that the stop at Morecambe is made, but also because the layout of the lines at Morecambe compels trains from the Western Division to reverse direction in Morecambe Promenade station if proceeding to Heysham. With some acceleration of the work at the port and of the steamer crossing, Belfast will still be reached at 6.35 a.m., even though the 7 p.m. departure form London will be 50 min. later than at present and 2 hr. later than in Midland days from St. Pancras. Other L.M.S.R. changes include a new 3-hr. service twice daily over the 150¾ miles between Glasgow and Aberdeen—an excellent timing in view of the intermediate grades—and a 55-min. residential express between Glasgow and Largs, both of which innovations establish new records, so far as previous timetables are concerned. If some material improvement of the service over the L.M.S.R. Highland main line could be incorporated in the next timetable revision, as well as of the L.N.E.R. service between Edinburgh and Aberdeen, which with modern 2-8-2 locomotive power might well expect several daily services in not more than 3 hr. overall, the two companies might claim that some very comprehensive benefits had been conferred in 1937 on long-distance Scottish travel as well as on that south of the Border.

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A Tyneside Bridge-Ownership Problem

BOROUGH ROAD, one of the principal streets of North Shields, is spanned by a bridge carrying another road overhead. Although about a quarter of a mile distant from the nearest railway property, the maintenance of this bridge, which now needs renewal, is held to be the responsibility of the L.N.E.R., and an interesting page of early railway history is thereby recalled. It appears that the Newcastle & North Shields Railway Company obtained Parliamentary powers in its Act of 1836 to build a branch railway from North Shields station to the River Tyne, but, instead of so doing, constructed a road. This involved cutting through a ridge of high land, and the bridge now in question was built to connect the severed ends of the road on the high level. The new road to the river, named "New Cut," was a private road and when, in 1855 and 1856, the railway company sold all the land adjacent, it imposed a condition in the conveyances that the purchasers were to be responsible for maintaining the road in good repair to the satisfaction of the Borough Surveyor, until such time as it was taken over as a public street. Some years later it was taken over and became "Borough Road." The absence of responsibility on the part of the railway company for street maintenance at that time possibly accounts for the obligation to repair the bridge not having been transferred to the Corporation. Arrangements have now been made for this bridge to be replaced by a footbridge which will be maintained by the Corporation on completion. The old bridge now condemned is the last remaining wooden bridge on the railway with an arch of laminated timber, and it is proposed to preserve a section of this in the York Railway Museum.

* * * *

Redecking Penmaenmawr Avalanche Tunnel

FROM a railway engineering point of view, unusual interest is presented by work in progress at the avalanche tunnel, near Penmaenmawr, on the Chester to Holyhead main line of the London Midland & Scottish Railway. The work now in hand in connection with this unusual structure is being carried out by the L.M.S.R. District Engineer at Bangor, Mr. C. R. Irving, to the requirements of Mr. W. K. Wallace, Chief Engineer, L.M.S.R., to whom we are indebted for particulars of the work. The avalanche tunnel is situated on the sea coast between Penmaenmawr and Llanfairfechan. The coast along this stretch is very rugged and lies under precipitous mountains, and consequently the construction of this part of the railway presented many formidable problems. One of these occurred at the point where the avalanche tunnel is situated, where two lines of track had to be laid below and through the Penmaenmawr mountain (which name may be translated as "head of the large rock"); the neighbouring town takes its name from this mountain.

Originally, a tunnel was made through the mountain, and at each end avalanche sheds were constructed, of timber roofing, sloping from the side of the mountain to a wall which served not only as a parapet to support the timber roofing of the avalanche shed, but also as a retaining wall to support the track, and as a protection from the ravages of the sea. This construction was considered necessary owing to the steepness of the mountain side and the presence of natural screes, which might at any time slide on to the railway; hence the name avalanche tunnel, which was constructed to carry the screes over the railway on to the shore below. These screes, which consist of steep slopes of blue shale and shattered granite, are the result of weather effects of many years, and are of a very loose nature. The timber roof over the railway was laid at a pitch of 30 deg. from the horizontal to carry any falls of scree over the railway and on to the shore below. As these structures became due for renewal from time to time, the form of construction was gradually strengthened, and at the present time it consists of steel plate girders laid at about 8-ft. intervals for a length of 145 yd. on the eastern side of the tunnel; and for 50 yd. on the western side of the tunnel. The portion of the tunnel between these two lengths is cut through rock for a length of 250 yd., and the total length of the tunnel is 445 yd.

Recently it was found that it would be necessary to renew or replace the timber baulks in the shed roof of the eastern section, but, owing to the tendency for water to percolate through the timber construction, to the detriment of the steel girders, it has been decided to substitute a concrete roof, reinforced with old permanent way rails. Views showing the erection of this new roof are reproduced on page 1122. To carry out the work, an opening, about 8 ft. long by 14 ft. wide, has been made in one bay between two cross girders, and a Scotch crane has been erected on the roof alongside the opening. Staging has also been erected, and Decauville track laid on the shed roof to facilitate the loading and transport of the materials removed and the movement of those required in the reconstruction. The materials are lifted and lowered at night time into wagons standing on the running lines below by means of the crane operating through the opening between the girders. The actual work of redecking the avalanche shed will proceed in sections spread over a period of three or four years.

PUBLICATIONS RECEIVED

Denmark on Ten Pounds.—By Sydney A. Clark. London: Ivor Nicholson & Watson Limited, 7, Paternoster Row, E.C.4. 6¾ in. × 4¼ in. × ¾ in. 204 pp. and folding map. Illustrated. Price 5s. 0d. net.—One of the reasons for Mr. Clark's enthusiasm for Denmark is that it is what he calls an "*abonnement* country." That is, period tickets are issued for unlimited travel within a specified time over the whole railway system. The author keenly appreciates the sense of freedom to travel where one will without worry that such a facility confers, and even the planning of intricate journeys with the help of a timetable he describes as "marvellous fun." Thanks to their low fares, the railways fit very neatly into his scheme of economy travel, but he also caters, of course, for those who use other means of transport; or are content merely to sample the delights of a single city, such as Copenhagen. Travellers of all tastes will find that Mr. Clark has taken thought for their interests in planning his ten-pound budget. From a survey of Copenhagen cafés and places of amusement, he passes on to the attractions of the countryside, with a special section for cyclists. His final chapter is a collection of "Fifty Vivid Memories," any one of which is a powerful inducement for the reader to follow in Mr. Clark's footsteps.

Quarterly Review of Chinese Railways, Vol. I, No. 4. Nanking. Institute of Railway Economics, under the Ministry of Railways. 10 in. × 7 in. 176 pp. Price $1.00 ($3.00 per annum).—This new number, which is again excellently printed and produced, contains much interesting and valuable information. The introductory article is "An Appreciation of Railways in China," by Sir Hughe M. Knatchbull Huggesen, H.B.M.'s Ambassador to China, and this forms the subject of an editorial note published on page 1098. The Minister of Railways himself, H.E. Chang Kia-ngau, contributes a comprehensive article on the President's "Five Year Plan of Railway Development." This plan, to which we have already referred in our Overseas columns, aims at the opening of 1,000 miles of line a year during this quinquennial period, and paves the way for the 100,000 miles of railway included in Dr. Sun-yat-Sen's Plan of Industrial Development. In any country but China such figures would be considered fantastic, but when one considers the progress that is already being made in railway expansion in that vast country—where there is as yet little trained staff, and full confidence in the financial integrity of the Government is only now being recognised—almost anything seems possible.

The article goes on to outline the scheme area by area and railway by railway, and concludes with notes on finance and the essential factors for reforming the railway service: punctuality, preparedness, management through statistics, tourist traffic, and cultural development and enlightenment of the people through the New Life Movement. Of punctuality, General Chiang Kai-shek, in an address quoted, says: "Few people realise that punctuality is a prerequisite to the building up of an orderly character, and constitutes the first essential to the development of railway service."

Other interesting articles are also included, upon "Steel Bridges" and "Rolling Stock," which latter embodies outline diagrams of the proposed Chinese standard locomotives; 4-6-2 (*a*) with light and (*b*) with heavy standard tender; 4-8-4; 2-8-4; and 2-10-4 types. There are also articles on various railways and on "Unification of Railway Control" and "Utilisation of Foreign Capital," as well as historical and descriptive contributions.

Ironclad Switchgear.—A new illustrated leaflet, No. X7975, from the General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2, shows several additions to the range of G.E.C. Ironclad switchgear. Among the items listed are 30-amp. double-pole switches with fuses; double splitter units; and 500-amp. fuseboards. The switchgear is made to different specifications according as to whether it is for general purpose use or for industrial installations where robust mechanical strength is necessary. This catalogue will be found particularly useful not only by reason of the new apparatus described, but because it is abridged from the complete Ironclad lists to show in a clear and condensed form those lines that are in most demand.

Southampton Municipal Airport.—Airport and airline developments in this country have not progressed entirely side by side. For a time, the transport facilities were ahead of the somewhat sketchy accommodation at landing grounds. Today, it sometimes seems that the design of airport buildings and equipment has outstripped, if not the standards of comfort and convenience achieved by modern passenger aircraft, at least the intensity of service which it is so far economic for them to provide. Southampton airport, described in an illustrated booklet which we have received from the corporation, is subject to severe seasonal variations in traffic, and as an exchange point on journeys from South Wales, the Midlands, and the North, to the Isle of Wight, and the Channel Islands, would in any case be subject to a falling off of business between holiday seasons. Yet there is no reason why that falling-off should not become less severe than it is at present, for with landing, control, and direction-finding facilities as are provided at this aerodrome, the disadvantages of bad weather flying may be largely counteracted, and a certain amount of pleasure traffic, at least at week-ends, maintained all the year round. The accommodation in the passenger buildings accords with the up-to-date technical equipment. The customs hall, café, and waiting room are well appointed and conveniently situated from the point of view of travellers alighting, embarking, or changing services, while for those proceeding by train there is the convenience of the special motorbus connecting with the Central station of the Southern Railway. A good impression of flying activities at the airport is given by the illustrations in this booklet, some of which, reproduced from our own pages, show machines of Railway Air Services calling at Southampton.

Holidays by Road, Sea, and Airway.—From Dean & Dawson Limited, 7, Blandford Square, London, N.W.1, we have received three booklets dealing with various forms of travel holiday. Inexpensive trips to the U.S.A. and Canada in luxury liners are the subject of one of the publications. Sailings are either to New York, with rail connections to Canada, or direct to Quebec. New ideas for Continental travel are presented in "Holidays by Airway," a booklet having numerous illustrations showing the high standard of comfort achieved in the modern air liner cabin. A third booklet gives particulars of motorcoach travel at home and abroad, at inclusive rates for transport and accommodation.

Duplicate Busbar Switchgear.—An illustrated folder has been published by Switchgear & Cowans Limited, Old Trafford, Manchester, describing duplicate busbar switchgear incorporating the maker's internal isolation principle. In this apparatus the complete isolation of the circuit breaker and the selection of busbars are effected by moving the isolating contacts only, so that change-on-load can be introduced without selector switches and selector chambers. An interlocking mechanism ensures that the load can be transferred from one set of busbars to the other only when the coupler switch is closed. The switchgear is assembled on the unit principle, so planned that in normal service the two sets of bars are electrically and physically separate throughout the entire switchboard.

Copper Products for Railway Engineering.—"Everything in copper for railway engineering" is the slogan appearing on this folder from Thomas Bolton & Sons Ltd., Mersey Copper Works, Widnes, Lancs. The claim is substantiated in the letterpress, which describes how the firm, which was manufacturing copper and copper alloys many years before the advent of the steam locomotive, has extended its business until it is now supplying copper parts to all home, and many Dominion, Colonial and foreign railways. All types of firebox plates are manufactured, including wrapper-, door-, throat-, side-, and tube-plates. Stay-rods are supplied in the solid or hollow-drawn types, and copper tubes of all sizes and gauges are produced for locomotive boiler and other purposes.

THE SCRAP HEAP

Answer to Railway Problem No. 9

17s. 6d. If T be total,

$$\frac{T}{3} + 3s.\ 8\tfrac{1}{2}d. + \left(\frac{T}{4} - 2s.\ 4d.\right) + \left(\frac{T}{3} + 1d.\right) = T.$$

Whence T = 17*s.* 6*d.*

Railway Problem No. 10

THE TUNNEL

An old gentleman, who was having a nap in a railway carriage, woke up with a start when his train, which was travelling at 30 m.p.h., entered a tunnel. It took the train 6 sec. to enter the tunnel, and a further 54 sec. to pass completely through it.

The old gentleman, who lived at Ealing, had a daughter named Daphne, who bred prize canaries, and a son who was a broker, or something, in the City.

What was the length of the tunnel?—*From "A Problem a Day," by R. M. Lucey. Faber & Faber. 5s. net.*

* * *

CIGARETTES IN COACH CEILING.

When one of the coaches used on the Brussels—Calais line arrived recently at the repair depot at Lille to be overhauled, a workman found concealed in the ceiling several hundreds of packets of English cigarettes.

* * *

According to a recent issue of the Soviet newspaper, *Izvestia*, the travelling ticket inspector and chief conductor found a man in one carriage without a ticket. Not even waiting for his explanation they pulled him out on to the end platform and kicked him out of the train, which was travelling at speed. With a fractured skull and other injuries the man was taken to Perm hospital, where it transpired that he was a permanent-way worker who had been sent in the train with a message from his superior. No action has yet been taken against the conductor and collector.

* * *

The first stone of a viaduct intended to cross the Mostyn Valley, was laid by the chief engineer, John Dixon. The ceremony observed was similar to those on most occasions of the kind, with this exception, that in lieu of the coins being deposited under the stone, Mr. Dixon placed them on the top, a proceeding very gratifying to the multitude of workmen assembled, who converted them into liquids, wherewith to drink success to the undertaking.—*From the "Liverpool Journal" of March 8, 1839.*

* * *

QUEEN MARY'S INTEREST IN RAILWAY TRAVELLING

In the course of his speech as Chairman of the Engineering and Transport Coronation Dinner, recently held in Buenos Aires, Mr. M. F. Ryan, General Manager of the Buenos Ayres & Pacific Railway, referred to an incident in illustration of the interest which the members of the Royal Family took in railway operations. He related that on one occasion when Queen Mary was travelling on the Southern Railway, she sent for Mr. Cox, the Traffic Superintendent, who was about to retire and was making his last journey on a royal train, to bid him good-bye. Mr. Cox noticed that the Queen had a small travelling clock on the table beside her, and had been checking off with a pencil the passing times of the stations set out on the special timetable provided for royalty when travelling by rail.

Great Western Railway.

(For the use of the Company's Servants only)

No. 63.

NOTICE

OF

SLEEPER TRAINS

BETWEEN

CHELSEA & HAYES.

Commencing JUNE 11th, 1877.

FROM CHELSEA			1	2
			a.m.	a.m.
Chelsea, dep			5 0	11 10
West London Junction	arr.		5 20	11 30
	dep.		A	B
Castle Hill, arr			5 38	11 50
	dep.		—	12. 0
				p.m.
Hayes, arr			6 5	12.12

TO CHELSEA.			1	2
			a.m.	p.m.
Hayes, dep			7.15	1 30
Southall, arr			7 23	1 38
	dep.		7 25	1 40
West London Junction	arr.		7.40	1 0
	dep.		7.50	1 5
Chelsea			8.10	2 20

A To follow 5 30 a.m. Down Passenger Train.

B To follow 11 45 a.m. Down Express, and travel at Castle Hill for 12 0 noon, ex Paddington to pass

Engines and Guards to start from Paddington

Mr. Higgins must satisfy himself that proper arrangements are made and understood at Chelsea, for the reception and despatch of the Trains.

Particular attention must be paid to this Notice and every effort made to ensure punctual working.

G. N. TYRRELL,
Superintendent of the Line.

June 6th, 1877.

Acknowledge Receipt to Head of Department.

Train notice in connection with the transfer of 80,000 sleepers from Chelsea basin to the newly-established Hayes depot. ***(See editorial note on p. 1099)***

One Hundred Years Ago

Extracts from the June, 1837, issue of "The Railway Magazine" (afterwards "Herapath's Railway Journal") and the oldest constituent of THE RAILWAY GAZETTE

Dublin and Kingstown Railroad.—On the 13th instant (presumably May 13), the works, which have been long in progress, for extending the railroad from Salthill station to the newly-completed quay at the angle of Victoria-square, Kingstown, were completed. The new terminus presents a strong contrast to the former one, and will prove beneficial to travellers returning from, or proceeding to, England.

Mr. Robertson's Action against Mr. Wyld, the Publisher of the "Railway Magazine."—About the spring of 1836, Mr. Robertson commenced a series of unprovoked and virulent attacks on the Editor of this Magazine, which he continued almost weekly for several months, in the little periodical he edits. Of these we never took the slightest notice, but latterly, having felt it needful on public grounds to make some remarks, which we intended for the good of the Company, on their proceedings, and some of which remarks naturally enough pressed on him as the secretary, we were again assailed with threefold fury from his little battery. We, however, proceeded straight forward with our well-intended observations, when all at once, after exhausting his arts and abuse, Mr. Robertson turned off from the pen, with which unprovoked he had begun, to the law, and commenced an action against the unoffending publisher, though the name of the Editor stands prominently forward on the wrapper. In addition to all this, Mr. R's solicitor wrote to every agent of the work, making similar threats. The object is, of course, apparent, but we think it will signally fail. We have too much respect for the laws of our country to make any observations on the conduct of Mr. Robertson while the cause is pending. But we have felt it our duty to state the facts; and we leave our readers to make their own comments thereon. We have only to add, that we believe Mr. Wyld is not the man to shrink from meeting Mr. R. in a court of law, if he wishes it, and, as to the issue, we have no apprehensions.

Paris and St. Germains.—Vast numbers of persons flock to view the progress of the railroad constructing from Paris to St. Germains. The works are in a very advanced state, and it is asserted, but which we doubt, will be quite ready to come into operation in July.—*From the "Liverpool Standard."*

Leipsic, April 24.—The railroad from Leipsic to Althen (two leagues) was opened to-day in the presence of a great concourse of spectators. His Royal Highness Prince John was present, and took his seat in the first carriage. The journey was performed five times from Leipsic to Althen and back in the course of the day. The first time the distance of two leagues (five miles) was performed in 21 minutes.—*From "The Times."*

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

BRAZIL

Estrada de Ferro de Goyaz

The first section of this railway was opened for traffic on September 28, 1911, under the direction of a private company, but was taken over by the Federal Government on January 7, 1920. Receipts for 1936 amounted to 4,351 contos and expenses to 3,696 contos, compared with 3,605 and 3,030 contos respectively for 1935, leaving a credit balance of 655 contos or 80 contos more than in the previous year. Receipts and expenses for 1936 were made up as follow:—

Receipts:—	Contos
Passengers	1,152
Parcels	192
Animals	57
Vehicles	10
Goods	2,113
Telegrams	92
Warehousing	9
Loading and unloading	155
Ad-valorem charge	394
Various	177
Total	4,351

Expenses:—

	Staff (Contos)	Material (Contos)	Total (Contos)
Administration ...	404	35	439
Traffic Dept. ...	680	76	756
Locomotive Dept.	634	545	1,179
Permanent Way	826	456	1,282
Various	—	39	39
Total	2,544	1,151	3,695

Other comparative figures for the two years were:—

	1935	1936	Diff. Per cent.
Passengers, No. ...	127,930	148,243	15·9
Parcels, tons ...	1,975	2,187	10·7
Goods, tons ...	72,768	73,165	0·5

In spite of a big decrease in rice tonnage, due to a poor harvest, it produced the highest traffic figure of 18,933 tons, which was 10,500 tons less than in 1935. Other traffics, however, especially coffee, dried meat, salt, bricks, tiles and barbed wire, increased considerably, and a very noteworthy increase of 319 tons of cotton demonstrates the interest taken in this cultivation during the last two years. Prior to 1935 this product did not enter into the railway's statistics.

During the year a survey of the projected extension from Annapolis to Inhumas, was completed up to the banks of the river João Leite, a distance of 30 km. Preliminary works for this extension proceeded steadily, but large seams of solid rock made excavation difficult. With the introduction of compressed air plant, however, progress during 1937 will be greater, and at the same time stone ballast will be prepared with the aid of stone-crushing machinery now on the spot.

Madeira-Mamoré Railway

A Decree, No. 1547 and dated April 5, 1937, has been signed, rescinding the contract approved by Decree No. 7,344 of February 25, 1909, between the Federal Government and this railway. The rescission enjoins certain conditions, binding to both parties, which stipulate that the Federal Government shall pay to the railway company the sum of 17,514 contos of reis and refund the surety of 500 contos (nominal value) deposited in the National Treasury; also that the rescission shall be considered effective as from July 10, 1931, the date on which the Federal Government took over.

The railway, on the other hand, must accept this sum, payable as indemnisation, and recognise the Federal Government as sole proprietor of the equipment constituting the railway, also all buildings erected by the company, all land at Porto Velho, at other stations, and along the line, as well as electricity works, water and light supply, sawmill, steamships, ice factory and other accessories. The railway will also desist from claiming against any acts practised by the Government in relation to constructional contracts, leases, &c., as also for losses suffered as a result of the sinking of the pontoon Guaporé. In turn the Federal Government will forgo all penalties imposed by the Ministry of Transport due to any non-compliance of the terms of the contract.

DENMARK

Railcar Developments

Important additions to the Lyntog, or fast diesel-electric railcar services in Denmark have been brought about with the introduction of the summer timetables. The general principle is that every important city and town in the country shall have fast communication with the capital twice daily, morning and evening in each direction, and also that by means of railcar connections at the stops made by the Lyntog, the entire country shall derive benefit by the improvement of communications. Among the new trains, Nordjyden leaves Aalborg, in the north of Jutland, at 6.40 a.m., and reaches Copenhagen at 1.7 p.m., stopping only at Hobro, Randers, Fredericia, and the Great Belt ferry terminals of Korsor and Nyborg, 1 hr. 40 min. being occupied by the ferry crossing. The actual rail travel, therefore, takes only just over 4¾ hr. On the return journey Copenhagen is left at 5.52 p.m., and Aalborg reached at 12.30 a.m.

Another new train is Midtjyden, which starts from Struer, in the north-west of Jutland, at 5.55 a.m., and reaches Copenhagen (285 miles distant) again including the 1 hr. 40 min. for the ferry, at 1.20 p.m., with fourteen intermediate stops; returning from the capital at 5.40 p.m., it arrives at Struer at 1.8 a.m. The third new train is called Vesterhavet (the name of the train means "Western Ocean") and travels in the opposite direction, leaving Copenhagen at 7.40 a.m., and travelling to Esbjerg, whence it turns north-westwards along the Jutland coast to Ringkjobing, which is reached, after eleven stops, at 2 p.m.; the distance covered, again excluding the ferry, is 231 miles. Returning, Vesterhavet starts from Ringkjobing at 5.33 p.m. reaching the capital at 11.46 p.m.

Vestjyden Service

An important alteration concerns the train hitherto known as Vestjyden—which has now had a new four-car set substituted for the original three-car set—it has been renamed Englaenderen, and is reserved for English boat passengers via Esbjerg. It leaves Copenhagen at 12.30 p.m., and with an additional call at Kolding to connect with the Nordpilen railcar service through the mainland of Jutland between Frederikshavn and Flensburg (on the international importance of which comment is made in an editorial note on page 1099 of this issue), reaches Esbjerg at 4.55 p.m.; leaving again at 6.16 p.m., it brings into Copenhagen at 10.48 p.m. passengers who have left Liverpool Street, London at 4.10 p.m. on the previous day. An additional Lyntog is run during the holiday season from Copenhagen to Fredericia at 5.5 p.m., reaching there at 9.13 p.m., and from Fredericia at 9.19 a.m., reaching Copenhagen at 1.27 p.m.

The new Lyntog services replace steam trains that have now been withdrawn, considerably reducing the previous journey times; the journey between Aalborg and Copenhagen is reduced from nearly 10 hr. to 6½ hr., between Aarhus and Copenhagen from 7¼ to 4¾ hr., between Struer and Copenhagen from about 9½ to 7¼ hr., and between Esbjerg and Copenhagen from 7½ to to 4½ or 5 hr., according to the direction of travel. The other two original railcar units, Kronjyden and Ostjyden, continue to run in much the same time as previously; Ostjyden and Midtjyden, with Englaenderen, are all new 4-car units, the remainder of the services being with 3-car units.

In all, the diesel units, including Nordpilen, now cover 3,324 miles daily, and make 17 runs timed at over 60 m.p.h. from start-to-stop, the fastest of which are two from Roskilde to Slagelse, 38·3 miles, in 35½ min. (64·7 m.p.h.), another in 36 min. (63·9 m.p.h.), and one from Copenhagen to Korsor, 68·3 miles, in 65 min., at 63·1 m.p.h. The longest run without a stop is between Nyborg and Aarhus, 123·0 miles, including the crossing of the Little Belt bridge, in 126 min.

UNITED STATES

Labour Disputes

Labour difficulties have developed involving clerks and freight handlers in the New York metropolitan area, the railways being in the position of the "innocent bystander," while two unions contend with each other for the

privilege of representing an important class of railway employees. The Brotherhood of Railway Clerks and Freight Handlers is the recognised trade union of the railway waterfront freight handlers (of whom the railways employ many thousands, due to the fact that most railway freight received and despatched from New York is first moved by water). Non-railway waterfront workers are mostly members of the Longshoremen's Association.

Both the clerks' organisation and the longshoremen are affiliated with the American Federation of Labour, which recognises the jurisdiction of the clerks' union, but the latter does not admit negro workers to membership. Since many of the freight handlers belong to that race, the longshoremen's union, which receives them as members, has violated the clerks' domain, seeking to enlist all railway freight handlers in New York in its union. The clerks' union to maintain its dominion has threatened a strike to involve not only the freight handlers, but railway clerks and station employees generally.

The merits of the contentions of the opposing parties are being weighed by an emergency board of three arbitrators appointed by President Roosevelt, and under the law this board must be allowed 30 days to arrive at its decision; and thereafter 30 additional days must elapse before a strike may be called.

A similar jurisdictional controversy between the engine drivers' and conductors' trades unions on the one hand, and locomotive firemen and brakemen on the other, developed recently on the Southern Pacific in California, and a strike was threatened. That difficulty also is now being reviewed by a Presidential emergency board.

Meantime, discussions are still progressing between railway managements and all the railway unions as to the wage increase demands of the latter, which range up to a 20 per cent. rise over the existing wage basis. In addition, some of the unions are asking for a guaranteed week for all their members, with no reductions in staff to correspond with slumps in business. Months of negotiation, probably, will be necessary before agreement is reached on these demands.

The settlement of questions at issue (notably pensions) between the railways and their employees by negotiation rather than by legislation seems to have weakened the demands by the latter for make-work legislation, such as the full crew and train limit measures pending in Congress.

FRANCE

Higher Freight Rates in View

When questioned on proposals for increasing railway tariffs, the Minister of Finance said that he had favoured a rise of 10 to 15 per cent. in freight schedules, but no change in passenger rates. Meanwhile, the Minister of Public Works has drafted a Bill to make it obligatory for the railways to assure the maintenance of their own pension funds.

Further financial burdens have been imposed on the railways by the general rise in prices, the wage adjustments and charges involved in the new social laws, and the enforcement of the 40-hr. week. While it was originally estimated that the latter would necessitate the employment of 60,000 additional railway workers, it is now stated that this figure is below the mark, and that the railways must engage 80,000, without allowing for a large increase in the number of temporary workers and keepers of level crossings. The effect of this demand is likely to prove most detrimental to the country districts, which will lose many of their farm workers and village artisans, men who in many cases cannot be replaced.

CHINA

Hunan-Kwangsi Railway

The Ministry of Railways has approved the construction of this line, the final survey work of which will be completed in September. A construction headquarters is being established at Hengchow, whence the new line will take off from the Canton-Hankow Railway, and run via Chiyang (Kiyang), Ningling (Lingling) and Hsingan to Kweilin, the capital of Kwangsi. The inaugural ceremony for the construction will be performed by H.E. Chang Kia-ngau, Minister of Railways, on October 10.

Compensation for Fire Victims

The families of the victims of the disastrous train fire on the Canton-Kowloon Railway are to be compensated, and $100 will be given to the family of each passenger who was killed, and $30 made over to each injured passenger. Instructions have been given by the Ministry of Railways accordingly.

Financial Items

The Ministry of Railways is setting aside an appropriation of $10,000,000 for the redemption of the Japanese loan on the Kiaochow-Tsinan Railway.

The Ministry is also to issue bonds to the value of $7,000,000 to finance the development of Whampoa Harbour and railway construction on the Canton—Whampoa extension of the Canton-Hankow Railway.

A report from Nanking on April 30 states that the Executive Yuan has approved the issue of £2,700,000 Railway Bonds for the construction of a railway from Canton to Meihsien in north-eastern Kwangtung, the bonds to bear interest at 6 per cent. per annum and be redeemable in 30 years. Successful completion of negotiations for the grant of this loan by British interests to the Nanking Government is also reported.

The Board of Trustees for the administration of the British Boxer Indemnity Fund has granted a loan to the Ministry of Railways of $265,000 for the construction of the Tsishuyen railway workshops.

SWITZERLAND

Rhaetian Railway 1936 Results

In a session on May 10, the administrative board of the Rhaetian Railway approved the report for 1936, which compared with the previous year shows the following results :—

	1936 Fr.	1935 Fr.
Working receipts ...	9,145,322	10,287,098
,, expenses ...	7,114,598	7,386,712
Net receipts	2,030,724	2,900,386

The profit and loss account shows a loss of Fr. 2,162,127 as against Fr. 1,369,828 in 1935; this will be covered by transfers from reserves. The unfavourable result is mainly ascribed to bad weather during the summer and the general depression. Since the devaluation of the Swiss franc in September, 1936, however, traffic has appreciably increased, and the last winter sports season was a particularly good one. In order to relieve congestion on the Davos line, the halt at Davos-Wolfgang is to be provided with a crossing loop.

SPAIN

The La Robla—Bilbao Railway Cut

One of the most spectacular incidents of the civil war resulted on May 19 in the cutting of the La Robla—Bilbao railway near the village of La Vicella. The Asturian miners of the Government Militia succeeded in passing through the Nationalist lines and dynamiting the main line of the railway. When the charges exploded, a length of over 100 m. of track was destroyed, and as the damaged section is under fire from both sides repairs are likely to be considerably delayed.

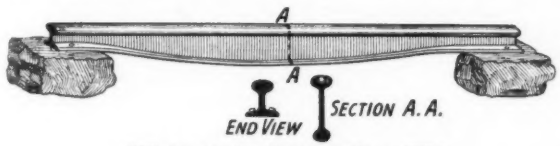
The Barcelona Traction Company

When the workers' councils seized control of industries and property in Spain, one of the principal sufferers among the British-owned undertakings in that country was the Barcelona Traction, Light and Power Company. The company was compelled last November to suspend interest payments on its bond issues, and the directors now announce that they have no alternative but to continue for the time being the suspension of the payment of the interest and of the operation of the sinking funds of the consolidated 6½ per cent. prior lien bonds, the 5½ per cent. first mortgage bonds, and the 6 per cent. 45-year bonds. The decision has been communicated to the trustees for the respective bond issues. The seizure of the property of the operating companies in Catalonia involved not only the working control of the railways and other public utilities, but also the funds and banking accounts of the companies and affiliated undertakings. No reference is made by the directors in the present announcement to the protest which was to be made by the British Government against the seizure of the property.

THE EVOLUTION OF RAILWAYS—V

By CHARLES E. LEE

RETURNING to the main channel of development, we find that, after the introduction of cast-iron facings on wagon-ways, the next step was to eliminate the timber longitudinals and cast the whole rail of iron. Here the pioneer seems to have been William Jessop who devised a rail 3 ft. long called the edge rail, of which the running surface was level but the under edge was elliptical, a form frequently called fish-bellied. It seems that the first rails of this kind were cast in 1788 and were



WM JESSOP'S PATENT RAIL 1789

laid on a railway between the canal dock at Loughborough and Nanpanton, which was opened in June, 1789. This line, which was of 4 ft. 8½ in. gauge, afterwards became a link in a chain of canal and railway communication serving the Charnwood Forest district.

According to Nicholas Wood, the first iron railway in the North of England was built in 1797 by Thomas Barnes on the line from Lawson Main colliery (Walker) to the River Tyne. Stone blocks were used instead of wooden

LAWSON COLLIERY NEWCASTLE-ON-TYNE 1797

sleepers, and both these and fish-bellied rails were novelties to the neighbourhood of Newcastle. Barnes played a leading part in the advancement of both railway and mining practice in the North, and would probably have become one of the great names of the early nineteenth century had he not died at Walker in 1801 at the age of only 36.

This seems to be the period that the word railway came into use on Tyneside. The "Term Reports" for 1798 give details of an appeal against a poor rate assessed on "a piece or parcel of ground called a waggonway situate at Wallsend and leading from a colliery there to the River Tyne." In this report is the following statement: "The appellants . . . made and laid a waggon-way in, through, and over . . . and to complete it they erected a bridge, and also in many places removed the soil and levelled the rising ground, and for the whole length of the way in the line, as the same was staked out to them, they put and placed sleepers or dormant timbers below the surface of the soil, and to the sleepers or dormant timbers they affixed rail-ways or waggon-ways." In a similar case[52] in 1787 the word used is "waggon-way" only, and there is no mention of "rail-way."

The next stage in the development of iron rails took place in Scotland, and it is therefore convenient here to notice briefly the introduction of railways in that country. In comparison with other parts of Great Britain little has been written on the subject of the very early days of rail transport in Scotland, and it is not generally realised that the beginning of railway construction north of the Border dates from the early years of the eighteenth century. As in other parts of the world, the first Scottish railways were wagon tracks laid to facilitate local goods traffic consisting chiefly of coal and iron. The first line appears to have been one from the coal mines at Tranent to the small harbour of Cockenzie on the Firth of Forth, which was laid down about 1722. The route passed close to the scene of the battle of Prestonpans, at which point it was carried on an embankment across the marsh, and at the time of the rising of Prince Charles Edward in 1745 a portion of this line was selected by General Cope as a position for his cannon. The original wooden rails are stated to have been replaced by iron in 1815, but this was by no means the first use of iron rails in Scotland.

Another Scottish wagon-way deserving of its place in history is one laid down at Alloa, on the Firth of Forth, in 1768. According to Sir John Sinclair's "Statistical Account of Scotland"[53] this "proved to be so great an advantage, that it induced the proprietor to extend it to the Collyland in 1771 . . . In 1785 the Alloa waggonway was worn out, and required to be renewed. This was done on a new plan; and it is now acknowledged to be the most complete in Britain. The sleepers are very broad, and only 18 in. from centre to centre. A rail of foreign fir, 4 in. square, is pinned down to them and another rail, of the same dimensions, is laid over it, and the whole well beat up in good clay; on the top of the upper rail is laid a bar of malleable iron, of 1¾ in. breadth; and nearly ⅝ in. thick. The waggons have cast iron wheels, 27½ in. diam., and are supposed to weigh altogether about a ton." Tredgold[54] tells us that the Alloa colliery railway was about 2½ miles long, and that one horse drew eight loaded wagons of which contained one ton of coal. He said, however, that the line was laid with cast-iron rails, so presumably the wrought-iron strips laid on timber were later replaced by complete rails of cast-iron.

Complete wrought-iron rails were probably first used on the railway at Sir John Hope's collieries at Pinkie which was laid by George Grieve; the rails were simple 1¼ in. bars. The *Mechanics' Magazine* of December 25, 1824, quoting from *The Scotsman* said: "The waggons generally used run upon four wheels of from two to three feet diameter, and carry from 20 to 50 cwt. Four or five of them are drawn by one horse. On the dead level railway, constructed by Mr. John (*sic*) Grieve for Sir John Hope, near Musselburgh, which is one of the most perfect in Britain, a single horse draws five loaded waggons, each containing 30 cwt. of coals, at the rate of four miles an hour—in all seven tons and a half, exclusive of the waggons, which weigh three tons more."

Wrought-iron rails of a stronger kind were used[55] by Mr. Neilson of Glasgow for a railway on the property of the Earl of Glasgow, beginning at the Hurlet coal and lime works and running some 2½ miles to the Paisley Canal. These rails were 2¼ in. deep, ¾ in. thick, and 9 ft. long, supported every 3 ft.; the wagons carried about 35 cwt. The wrought-iron rail thus appears to be one of the contributions of Scotland to railway progress, and,

[52] Rex *v.* Jolliffe, 2 "Term Reports," 90.

[53] Vol VIII, 1793.

[54] "A Practical Treatise on Rail-Roads and Carriages" by Thomas Tredgold. 2nd edition, London, 1835.

[55] Article "Rail-way" in Napier's Supplement to the "Encyclopædia Britannica."

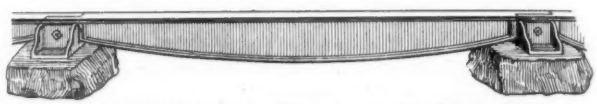
although it was introduced north of the Border only in a primitive form, Scottish experience was directly responsible for the invention of John Birkinshaw's famous rail that made the use of wrought-iron a practical proposition.

For much of our information on early Scottish railways we are indebted to a lengthy report prepared by Robert Stevenson, the famous Scottish civil engineer and light-house builder. Having been commissioned at a public meeting on September 3, 1817, he submitted this report in 1818 on a scheme called the Edinburgh Railway which was presented to His Grace the Duke of Buccleuch and Queensberry and other subscribers to the survey of a railway from the coalfield of Midlothian to the City of Edinburgh and the port of Leith. He mentioned the name of the late Mr. Jessop who was "the engineer for the magnificent works of His Grace the Duke of Portland in Scotland, connected with which there is a double railway from Kilmarnock to Troon, which is ten miles in length." Incidentally, the Kilmarnock & Troon Railway was authorised on May 27, 1808 (by Act of 48 Geo. III cap. 46), and was opened in 1811. Stevenson added: "The other railways in Scotland of any extent are those at the works of the Carron Company, Lord Elgin's, Mr. Erskine of Mar's, Sir John Hope's, and other coal works."

He stated that the formation of railways, or roads of cast iron, was comparatively but a recent discovery, which, however, was likely to be attended with immense advantage to that commercial and agricultural country (namely, Scotland), and his remarks on the construction of a railway are worthy of being quoted *in extenso*. He said: "From the great traffic to be expected upon the Edinburgh Railway, two sets of wheel-tracks will require to be laid—one for the wagons or carriages coming to town, and another for those going to the country. This double railway, with the necessary allowance for driving-paths, etc., will occupy at least 20 ft. of space in the cross section, viz., 4 ft. 3 in. for each set of tracks; a space of 4 ft. between the respective wagon-ways; and 3 ft. 9 in. on each side for a driving-path, fences and gutters. The horse-paths, or spaces between the wagon tracks of the railway, as proposed above, will be 4 ft. 3 in. in breadth, or the width of the *square part* of the common cart axle, it being also a great advantage for the convenience of loading, etc., and for the stability of the railway, to have broad and rather low wagons. But from the general use to which this public railway is applicable, it may be found advisable to acquire even a greater breadth than 20 ft. The space between the tracks will be made up with stones, broken very small, and blinded or covered with gravel, as in the best description of road-making." It will be noticed among many points of interest that gutters for drainage and careful ballasting are stipulated, and that a gauge of 4 ft. 3 in. is suggested.

Robert Stevenson then said that "the cast-iron tracks of the earlier railways were made flat, of about 4 in. in breadth, with a projecting ridge or flange upon the outer verge, and are technically called plate rails." He proceeded to condemn them on the grounds that they induced greater friction than edge rails and were more liable to get clogged with gravel and small stones. I think that the remark about plate rails being used by the earlier railways must be interpreted as referring to public railways—the subject with which Stevenson was dealing. On the subject of wrought-iron rails, Robert Stevenson's Edinburgh report stated that the application of wrought-iron instead of cast-iron rails was likely to be attended with the most important advantages to the railway system, and added that 3½ miles of this description of line had been in use for about eight years (therefore from about 1810) on Lord Carlisle's works at Tindale Fell, near Brampton, in Cumberland, where there were also two miles of cast-iron rail; but the wrought-iron track was found in every respect better. Stevenson also stated that experiments with wrought-iron rails had been made at Mr. Taylor's works at Ayr, and at Sir John Hope's at Pinkie.

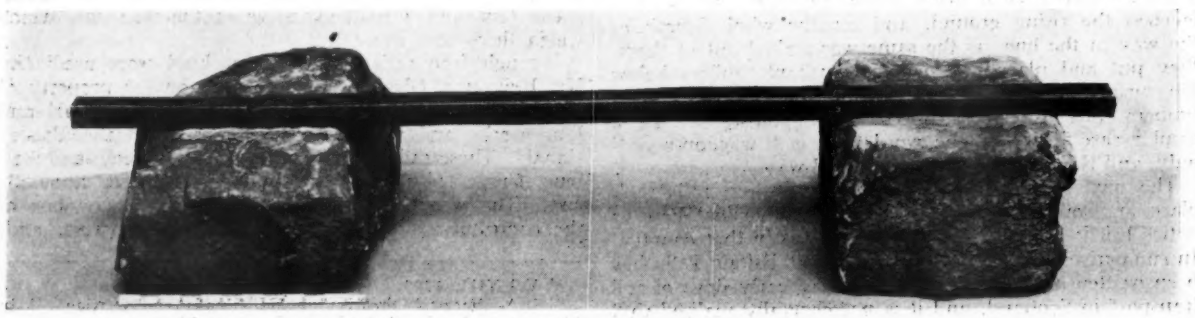
There is some doubt about the precise date of the introduction of wrought-iron rails in the North of England, although the period is fairly certain. Nicholas Wood said that they were "tried about the year 1805 at Walbottle



LOSH & STEPHENSON'S PATENT CAST RAIL 1816

Colliery near Newcastle-upon-Tyne by Charles Nixon; the rails were square bars 2 ft. in length, they were joined together by a half lap joint, with one pin, one end of the rail projecting beyond the end of the adjoining one two or three inches. Their use at this time was not extended, as the narrowness of their surface would cut the periphery of the wheels of the carriages; and they were on that account superseded by the cast-iron rails with a broader surface." The obvious solution of making the wrought-iron rails broader was not a practical proposition at the time, owing to the greater cost of wrought-iron. Other objections raised were that they were subject to oxidisation and lamination. The points were raised by W. Chapman of Newcastle in his report on the proposed Newcastle & Carlisle Railway, and drew a reply in 1824 from Michael Longridge, one of the partners in the Bedlington Iron Works, in which he quoted a letter from Mr. Thompson, Lord Carlisle's agent at Tindale Fell. This letter stated[56] that wrought-iron rails "had been laid down for sixteen years, and had no appearance of lamination . . . The whole of the wrought-iron, which has been used from

[56] The *Newcastle Courant* of December 18, 1824.



Tindale Fell wrought-iron rail of 1808 *preserved in the Science Museum, London*

12 to 16 years, appears to be very little worse. The cast iron is certainly much worse, and subject to considerable breakage, although the rails are about double the weight of the malleable iron rails. The waggons used, carry near a Newcastle chaldron, viz. 53 cwt." It will be seen that by subtracting 16 from the date of the report, we arrive at the year 1808 as that in which wrought-iron rails were first used at Tindale Fell. This is the generally accepted date of the first experiments here, and it is understood that 3½ miles in all were laid with wrought-iron bars between 1808 and 1812.

To overcome the difficulty of weight and cost, John Birkinshaw, of the Bedlington Iron Works, secured a patent on October 23, 1820, for an improved method of

WROUGHT IRON RAIL PAT^D BY JOHN BIRKENSHAW 1820

rolling railway bars. The method, in Birkinshaw's own words,[57] was that of " making these railway bars wedge-form, by which means the same extent of surface as the cast-iron rail was preserved for the wheels to travel upon, and the depth of the bar increased without adding unnecessarily to its weight." According to Tomlinson,[58] the incentive to Birkinshaw to solve the problem of using wrought-iron rails was an offer to his employers from the Willowbridge or Bedlington Glebe Colliery of coal at a reduced price, provided a wagon-way was laid from the colliery to the works. The fact, already mentioned, that Birkinshaw's inspiration came from Scotland is clearly shown in a letter of the following year written by George Stephenson. Shortly after the patent was taken out, George Stephenson, on the advice of Michael Longridge, joined Thomas Mason as a partner in working the Bedlington Colliery, and although the proposed wagon-way was laid by the iron works, it was probably planned by Stephenson himself. The letter, which was from George Stephenson to the Scottish Robert Stevenson, was dated from Killingworth Colliery on June 28, 1821, and accompanied copies of Birkinshaw's specification. It said " The hints were got from your Report on Railways. . . . Your reference to Tindal Fell Railway led the inventor to make some experiments on malleable iron bars, the result of which convinced him of the superiority of the malleable over the cast iron—so much so, that he took out a patent. Those rails are so much liked in this neighbourhood, that I think in a short time they will do away the cast-iron railways. They make a fine line for our engines, as there are so few joints compared with the other."

This railway at Bedlington was highly successful and its fame soon spread. William James, who was one of the earliest promoters of public railways, wrote on June 22, 1821, " light has at length shone from the north, and I pronounce as my decided opinion that the malleable iron rail road at Bleddington (*sic*) Works is by far the best I have ever seen both in respect of its material and its form." The Scottish Robert Stevenson also seems to have been greatly impressed with this railway, and in a letter[59] dated September 6, 1821, said " perhaps the best example of this kind of railroad is to be found at Bedlington Ironworks in Northumberland, where Mr. Longridge has laid about three miles of it." The same railway was visited early in 1824 by a deputation from the Liverpool & Manchester Railway, and rails weighing 17 lb. a yard were then exhibited which had[60] been " in active use for upwards of three years, but did not appear to have received the least injury from rust."

The Stockton & Darlington Railway—usually hailed as the prototype of the modern public steam-operated railway—was planned to be laid with iron plate-rails to accommodate ordinary road carts. Locomotive traction was not contemplated, and the line was, in fact, intended to be nothing more than a public toll road. In a notable report dated May 19, 1821, however, George Stephenson set out his " observations on edge and tram railways " and advanced strong reasons for the adoption of edge rails and flanged wheels. Following this—on July 23, 1821, to be precise—the Stockton & Darlington directors pronounced in favour of edge rails in preference to tram plates.

We saw earlier that there was no standard gauge with the mineral railways of the seventeenth and eighteenth centuries, and this was still the position when public railways such as the Stockton & Darlington and the Liverpool & Manchester were being planned. In Northumberland and Durham the colliery wagon-ways differed from one

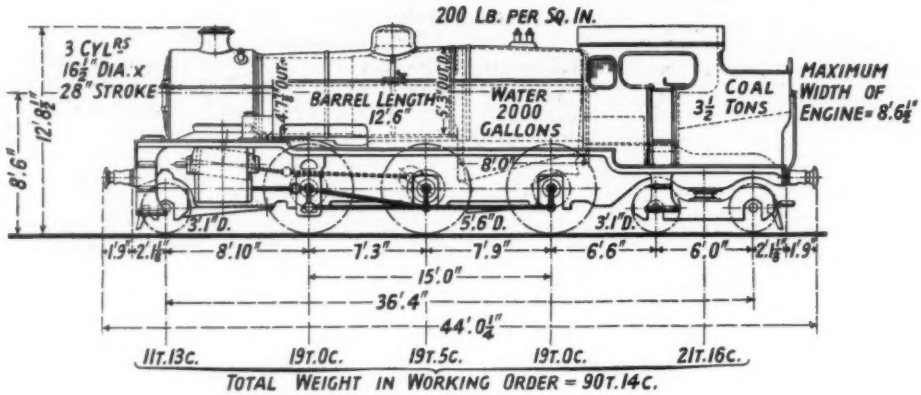
STEPHENSON'S WROUGHT IRON RAIL 1829 MANCHESTER & LIVERPOOL RLY.

another by some inches, ranging from the 4 ft. of the old Tanfield line up to 5 ft. Naturally where one branched off another the gauge of both was constant, and this apparently was the reason that the famous Killingworth line, on which George Stephenson gained his early experience, was laid to 4 ft. 8 in. It was built in 1806 as an extension of the old Long Benton line of the Grand Allies, the first section of which had been laid in 1762. Why the particular figure was selected is unknown—incidentally, it was 4 ft. 8 in. and not 4 ft. 8½ in. There is a theory on Tyneside that Stephenson was influenced by the gauge of Roman wheel ruts uncovered along Hadrian's Wall, but this is not very convincing, as Stephenson had nothing to do with the building of the Killingworth Railway. It is probable that, as he built his first locomotive for that line, he accepted the gauge without demur. Certainly he used it for the Hetton Colliery, the first he actually constructed, which was opened on November 18, 1822. Moreover, he visualised the eventual linking up of railways all over the country and therefore adopted the present standard gauge for all lines with which he was connected.

The Scottish Robert Stevenson's belief that railways would ultimately become the main land highways of the world led him to write to Lord Melville on January 29, 1825, that " it seems necessary at this time . . . . that a Committee of the House should take the subject of regulating the width according to the number of tracks . . . . in a public Act, otherwise much confusion will ensue. It will be a great loss if these railways, like the common road, should require to be altered that they may communicate with each other." No such step was taken at the time, and the result was a considerable amount of gauge conversion in later years, not only on the G.W.R. but also on railways in East Anglia and Scotland.

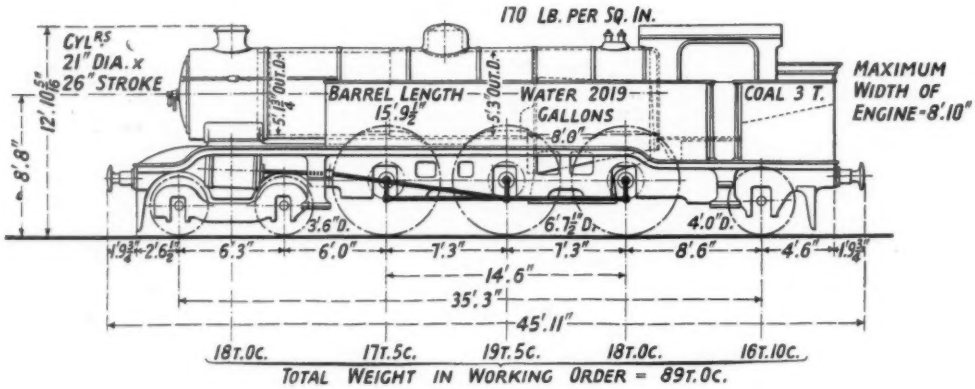
[57] Letter from Michael Longridge to George Buchanan.
[58] " The North Eastern Railway: Its Rise and Development " by William Weaver Tomlinson.
[59] Letter from Robert Stevenson to Rd. Scruton and others interested in building a railway near Durham; quoted in the *Mining Journal* of April 5, 1862.
[60] " Illustrations of the Origin and Progress of Rail and Tram Roads, and Steam Carriages, or Loco-motive Engines " by T. G. Cumming. Printed for the author and published at Denbigh in 1824.

British Locomotive Types—No. XV



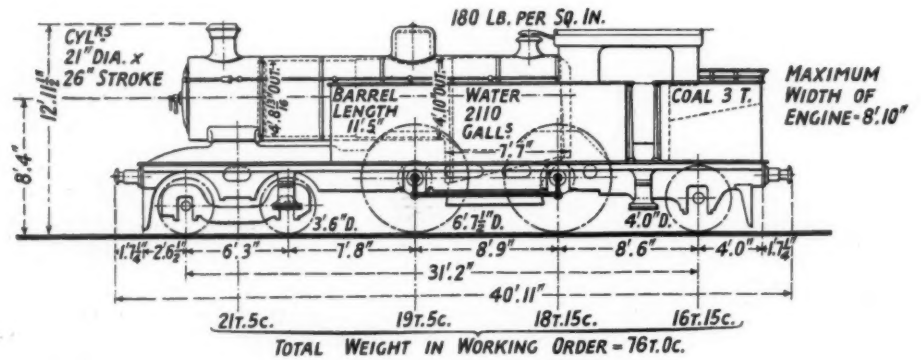
HEATING SURFACE, TUBES—		SUPERHEATER	285·0 SQ. FT.
LARGE AND SMALL	1,390·6 SQ.FT.	COMBINED HEATING SURFACES	1,810·6 ,,
FIREBOX	135·0 ,,	GRATE AREA	25·0 ,,
TOTAL (EVAPORATIVE)	1,525·6 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	29,452 LB.

W Class



HEATING SURFACE, TUBES—		SUPERHEATER	357·0 SQ. FT.
LARGE AND SMALL	1,462·0 SQ. FT.	COMBINED HEATING SURFACES	1,943·0 ,,
FIREBOX	124·0 ,,	GRATE AREA	25·16 ,,
TOTAL (EVAPORATIVE)	1,586·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	20,800 LB.

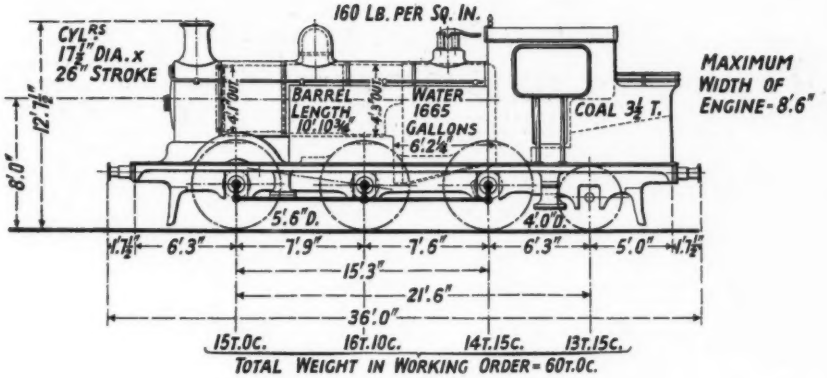
J¹ Class



HEATING SURFACE, TUBES—		SUPERHEATER	254·0 SQ. FT.
LARGE AND SMALL	1,126·0 SQ. FT.	COMBINED HEATING SURFACES	1,500·0 ,,
FIREBOX	120·0 ,,	GRATE AREA	23·75 ,,
TOTAL (EVAPORATIVE)	1,246·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	22,100 LB.

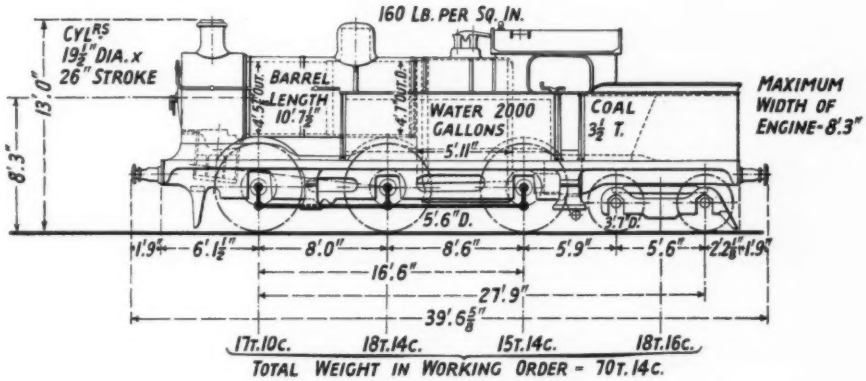
I³ Class

Southern Railway



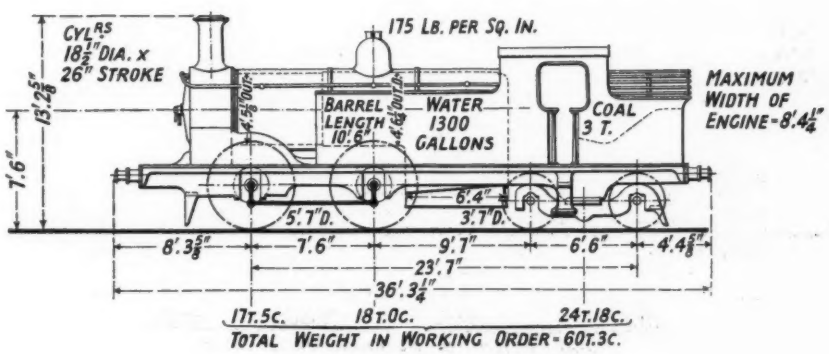
HEATING SURFACE—		SUPERHEATER	—
TUBES	1,088·0 SQ. FT.	COMBINED HEATING SURFACES	—
FIREBOX	105·0 ,,	GRATE AREA	19·32 SQ. FT.
TOTAL (EVAPORATIVE)	1,193·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	16,400 LB.

E⁵ Class



HEATING SURFACE—		SUPERHEATER	234·0 SQ. FT.
TUBES	887·0 SQ. FT.	COMBINED HEATING SURFACE	1,233·0 ,,
FIREBOX	112·0 ,,	GRATE AREA	17·6 ,,
TOTAL (EVAPORATIVE)	999·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	20,370 LB.

J Class



HEATING SURFACE—		SUPERHEATER	—
TUBES	1,067·0 SQ. FT.	COMBINED HEATING SURFACES	—
FIREBOX	124·0 ,,	GRATE AREA	20·36 SQ. FT.
TOTAL (EVAPORATIVE)	1,191·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	19,750 LB.

M⁷ Class

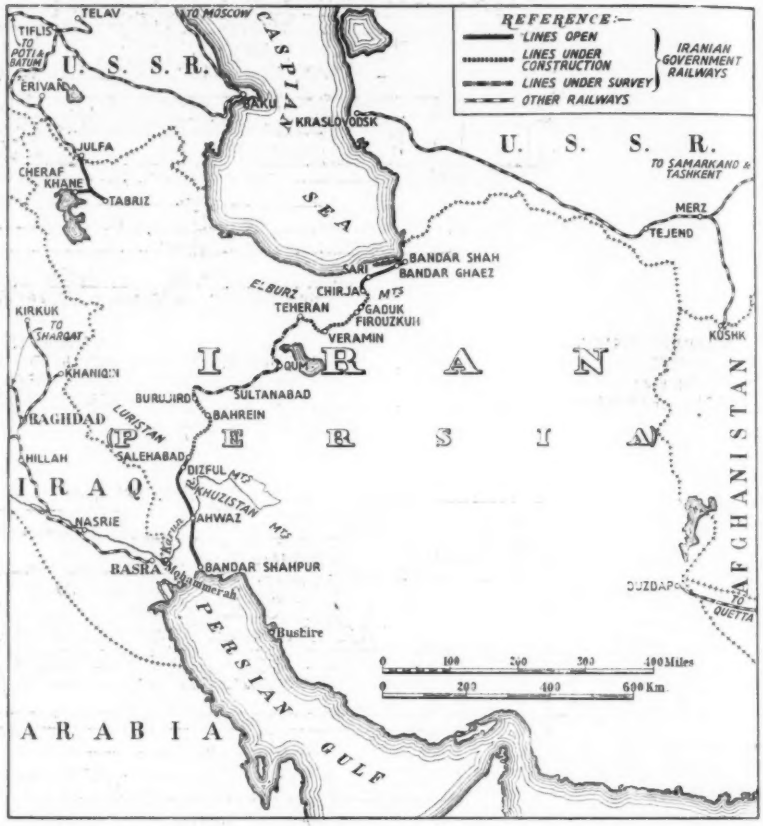
THE TRANS-IRANIAN (PERSIAN) RAILWAY

Further particulars of this great work and details of the northern ascent to the Elbruz summit

IN our issue of July 26, 1935, we published an illustrated article describing the principal features of the Trans-Iranian (Persian) Railway and showing the progress achieved up to that time. We are now able to give further particulars of this great work.

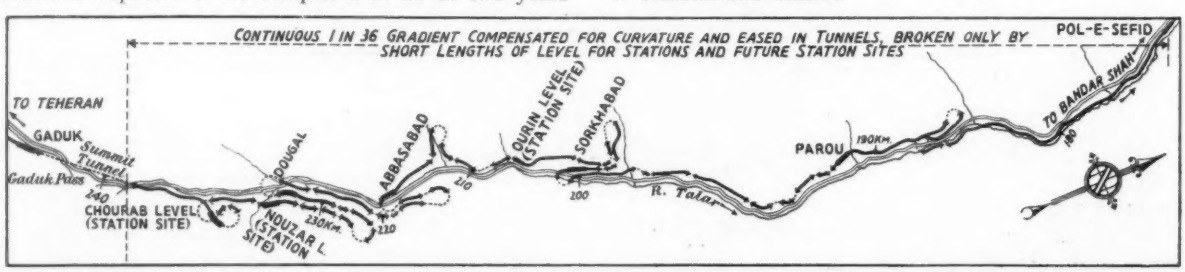
The northern section of the line, from Bandar Shah on the Caspian Sea to Teheran, is nearing completion, and at the capital a fine modern station has been built, equipped with all-electric signalling.

The exact altitude of the summit at Gaduk Pass in the Savad-Kuh ridge of the Elbruz Mountains is 6,929 ft., and the summit tunnel measures 3,150 yd. In the main ascent up the Talar Valley from Pol-e-Sefid to Gaduk, a distance of 22 miles as the crow flies, but 41 miles along the alignment, the line climbs through 5,058 ft., the ruling gradient being 1 in 36, compensated for curvature and eased in tunnels. In consequence of much of the work being directed by Swiss engineers, further particulars have lately appeared in the *Schweizerische Bauzeitung* in articles by Professor Grünhut, from a report of which in the *Zeitung des Vereins* the accompanying plan of this section of line is reproduced. It will be seen that the development of nearly double the direct distance by the line is accomplished by the construction of four long double spiral loops and one short one. Altogether in the whole length of the valley there are 60 tunnels and only one-third of the line is straight. The plan herewith and the illustrations in our previous issue give some idea of the difficulties encountered, but particular credit is due to the engineers for the way in which the work has been accomplished, as, owing to the pressure put on them to expedite the work, much had to be done without the amount of preparation and planning usual in such cases.



Sketch map showing the Trans-Iranian Railway relative to adjacent systems

The ascent from the Persian Gulf to the Iranian Plateau, comprising the Southern Section, has proved quite as difficult as the Northern, as, indeed, was anticipated in our former issues. The distance from Bandar Shah to Teheran works out at 523 miles, and the length of the whole line to Bandar Shahpur is 808 miles. The Southern Section is expected to be completed in about two years' time. In October last the Government stated that the construction of the line from Teheran to Tabriz, 650 km. (404 miles), mentioned in our previous article, is to be undertaken directly that from the capital to the Caspian Sea is open, so as to make a connection with Turkey as soon as possible, and also with Russia, via the 5 ft. gauge Azerbayejan line from Tabriz to Djolfa, where it meets the U.S.S.R. Caucasian system at the Irani-Soviet frontier. Very little is at present being heard concerning the construction of a connection with the northern Iraq lines, but on the other hand, it is probable that when the line to Tabriz is finished one will be undertaken from Kum to Isfahan and Shiras.



Sketch plan showing development of length by means of spirals on the 1 in 36 ascent from Pol-e-Sefid to Gaduk summit tunnel, 6,929 ft. altitude

HAMMOND REPORT ON THE TRANSPORT SYSTEM OF CEYLON

Although recommending the closing of certain sections of line, the Commission proves conclusively that the railway must be retained, but considers it should not itself run road or air services

BRIGADIER-GENERAL F. D. HAMMOND, C.B.E., D.S.O., accompanied by Mr. J. D. C. Couper, C.B.E., with Mr. J. F. M. Taylor, of the Great Western Railway, as Secretary, was appointed by the Secretary of State for the Colonies to report on the transport arrangements in Ceylon with the following remit:—

To visit Ceylon and to examine and report upon the transport system in the island; to indicate the proper place of the Government Railway in that system, and the measures necessary to enable it to take that place without continuing to be a charge on the general revenue of the island; and in particular to examine and report upon the following matters:—

(1) Whether any section of the railway should be closed or new sections added.

(2) Whether the railway should be permitted to run road or air services, and if so, to what extent.

(3) Whether further regulation, taxation and control of omnibus and lorry traffic is desirable and, if so, to what extent, and by what means.

(4) Whether any change in railway policy is necessary, as regards speed and number of trains, and fares and freight charged.

(5) Whether a change to electric or diesel traction on the railway is desirable, and, if so, to what extent.

(6) Whether any changes in the types of engines and rolling stock now employed by the railway are desirable.

(7) What changes, if any, are necessary in railway track, bridgework and signalling methods, both in the direction of modernisation and in order to make possible any changes recommended under the preceding heads.

The following is a summary of the conclusions and recommendations. Ceylon is an island almost the size of Ireland, its greatest length being 270 miles and its greatest width 140 miles; the population is about 5½ millions. In the south-west portion of the island mountainous country is found. The railway from Colombo, for the first 50 miles, is flat, but thereafter it rises steeply to a height of 6,225 ft. In one section the line rises 2,241 ft. in 28½ miles, and in another, 2,268 ft. in 23½ miles. Three-quarters of the population inhabits the south-west portion of the island. The main export is tea, which is followed in importance by rubber. With few exceptions the railway is extremely susceptible to attack from the road, involving almost the whole of its traffic both passenger and goods, by reason of the nature of the country and the short distances. The railway consists of 945 route miles of line, 828 of which are of 5 ft. 6 in. gauge. There are 4,698 miles of main road and 4,564 miles of minor roads.

In these circumstances the commission points out that the plea that the economic structure of the country will be upset if the railway is not protected, cannot be advanced, but it emphasises that for other reasons (referred to later), provided the railway organisation and finances are put on a proper footing, it is desirable to keep it open. Since the year 1934-35 the gross receipts have been less than the working expenditure, the estimated deficit for 1936-37 being over three million rupees. The cause of the fall in the receipts is mainly road competition, the roads not only obtaining traffic from the railway, but forcing the latter to lower its rates. Total goods receipts fell by 40 per cent., comparing 1934-35 with 1927-28, and total coaching traffic receipts fell by 44 per cent.

Turning to the situation of the roads, it is pointed out that, broadly speaking, the main roads are wide enough for the traffic which they have to carry. The various ordinances governing road transport, which are referred to in the report, and commented upon, are as follow:—

(*a*) Motor vehicles must be registered and numbered, for which a fee is charged.

(*b*) Before the vehicle can be used on the roads it must be licensed by a licensing authority which is in some instances an urban district council, and in others Government agents. There are 67 separate licensing authorities with no co-ordination of control. A licence can be withheld on the grounds that the vehicle cannot safely be used on the particular road; and that the road is unsuitable; or that the road is too congested. The fees from the licences are credited to the funds of the local bodies, and thus a direct incentive is offered to the local authorites to issue as many licences as possible.

(*c*) The ordinance enacts that an insurance policy shall be taken out. This section has never been put into operation, although there are adequate facilities in the form of well-recognised insurance companies.

(*d*) The ordinance enacts that the fares to be charged may be prescribed. This power has not been used.

(*e*) It is similarly enacted that regulations may be made restricting the number of omnibuses on a specific route. This power also has never been exercised.

(*f*) Regulations may further be made to require omnibuses to run to a timetable and to restrict the hours of work of drivers. These powers also have not been enforced.

To quote the report:—

As a result, it is difficult to describe the condition of affairs in the motor omnibus industry without appearing to exaggerate. Omnibuses are driven at high speeds far beyond the legal limits in the effort to snatch passengers. Many of the vehicles are in a dilapidated condition and have tyres worn down not only to the canvas but through some of the layers of canvas as well. Drivers are employed at the wheel for 16 hr. at a stretch.

Fares of all kinds are, of course, cut down to figures which not only do not permit of any margin for depreciation, interest on money invested, or even proper maintenance, but barely cover day-to-day expenses. Hire-purchase allows anyone to go into the business who can raise enough money to pay for the first instalment and the licence duty, with a little over for the first day's wages, petrol and oil. In view of these conditions it is not astonishing to hear, as we did from several witnesses, that most of the bus drivers now employed belong to a low and undesirable class, and that no lad of decent education and upbringing would take up the trade. There are a few substantial concerns to which this description does not apply, but there are, unfortunately, a preponderant number of the others who live a hand-to-mouth existence. When one of these fails there is always someone ready to continue the service, and the buses are in the market again at a reduced figure.

A similar state of affairs, though not so acute, exists so far as the motor lorries for goods traffic are concerned.

Conclusions Regarding Road Transport and the Retention of the Railway

The Commission, therefore, makes the following observation:—

We have thus arrived at the point that a central authority to control all forms of road transport is imperative, irrespective of the plight of the railway and of the interest of the public therein.

The evils which have followed from unbridled competition have brought the necessity of this home to everyone, the Government, the user, the owner, the commercial community, and the police. From a broader point of view it is clear that, quite apart from the attendant abuses, it is contrary to the public interest that so much capital should be wasted in this useless and harmful duplication of transport facilities. It does not matter whether the capital was originally spent by the State on railways and roads or by the individual on vehicles; it is equally wrong that it should be wasted in this way.

As mentioned earlier, the plea that the railway is essential cannot be raised, but the following considerations must be borne in mind:—

(*a*) The capital cost, over Rs. 200,000,000, has been incurred, and the value of the removable property would be very small.

(*b*) The problem of unemployment which would be created if over 10,000 men were thrown out of work, or had to be compensated, would be considerable in a country the size of Ceylon.

(*c*) As the capital charges would have to be met in any event it would pay to keep the railway open if it can be efficiently organised so as to include an adequate renewal fund.

(*d*) Considerable expenditure would be involved in widening and improving the main roads in order to convey the 10,000,000 pasengers and 1,000,000 tons of goods now carried by the railway each year.

In making recommendations in regard to the organisation of the railway, the commission assumes that a central authority for the control of all forms of road transport will be established, and that the routes and areas to be served, the number of vehicles to be licensed, and rates and fares to be charged will be fixed by it, and that the central authority will have regard in granting licences to the existing means of transport by the railway. The report then proceeds to detail what is required, firstly so far as the railway organisation and management are concerned, and secondly in regard to the control of road transport.

The Railway

Criticisms are passed on the organisation of the railway, which consists of a General Manager and Deputies at headquarters, and three Divisional Transportation Superintendents in charge of locomotive running, traffic operation, and commercial business. There is an Engineer, Way and Works, with a line organisation of his own; a Mechanical Engineer in charge of the repair shops; a Chief Accountant; and a Storekeeper. The commission comments on the organisation in the following terms:—

The principles of the divisional system are followed in that all the duties and responsibilities connected with the operation of trains and traffic in each division are placed under one head, but there is no officer placed specifically in charge of that branch and of the three officers in charge of the divisions. The Deputy General Manager (Operating and Commercial) is, according to the theory of the organisation, merely the staff officer of the General Manager, deputed to look after that side of the work. The chart of the organisation handed to us shows no lines connecting the five departments with the General Manager or his deputies. There is a complete break in the chart at this, the most important point, and thus the chart interprets the organisation correctly, although perhaps innocently, because the chain of responsibility at this vital point is shadowy and undefined.

The organisation interposes between the General Manager and the chief officers responsible for carrying out the work a layer of deputies who have no definite responsibility themselves, and the result was evident to us in the lack of co-operation between the various services

Other points in regard to the organisation to which the commission draws attention and makes recommendations are the following:—

Commercial.—Lack of serious endeavour to obtain traffic or to bring to notice the advantages of the railway. Alterations are required in the suburban passenger services and in main line speeds.

There are too many mixed trains.

The whole timetable requires to be recast.

Touch with the commercial community is poor.

Publicity methods should be improved.

Passenger accommodation should be raised in standard.

Collection and delivery services should be instituted in Colombo and elsewhere.

Operating.—The policy of intensive use of engines should be developed so as to reduce the number of engines in use. More efficient diagramming of train crews should be introduced.

The work of the control offices should be overhauled.

The types of locomotive in use are not suitable, and should be replaced by more modern machines.

Engine failures are high, and an intensive effort should be made to reduce them.

There are too many shunting engines.

There is scope for the use of containers.

More up-to-date and different statistics are required, which should be compiled by the Chief Accountant with mechanical appliances.

The methods of ticket inspection should be overhauled, as the present arrangements lend themselves to fraud.

A system of stamps for parcels traffic should be introduced.

Electric and Diesel Traction

The commission was specifically instructed in its remit to report on the subject of the use of electric and diesel traction. As to electric traction, the commission is of opinion that there are no indications of such a large increase in traffic as would justify the electrification of any portion of the system. The report reads: "we understand that a hydro-electric scheme is now under consideration. A scheme of this nature may be justified on grounds entirely independent of railway traction, but in calculating whether it is economically sound or not, no assumption that any portion of the railway is going to be electrified should be permitted."

With regard to diesel traction, three complete diesel units for passenger traffic will shortly be delivered, and their performance should be carefully watched. Whilst there is no need for any comprehensive adoption of diesel traction, when new locomotives are required (particularly for suburban passenger services or shunting) the *pros* and *cons* of diesel units should be considered.

Way and Works, and Signalling

The standard of maintenance on the more important lines is satisfactory, but the present speed limits are unnecessarily low. Increased speeds are desirable, but additional ballasting is required on some sections of the line. Transition curves should be introduced where possible. The layout of certain passenger stations is inadequate and causes delay to trains. The number of men employed on track maintenance is somewhat high, and a trial of the flying gang system is recommended. There are three separate engineering workshops and stores for the way and works, bridge, and signal branches respectively in Colombo; these should be amalgamated. Contract work should be adopted as far as possible.

Mechanical signalling appliances are maintained by the Way and Works Department, but all electrical signalling apparatus, including the railway telegraph and telephone systems, are in the charge of the Postal Department. Thus there is no individual officer responsible for signalling policy, and various additions have been introduced

without proper co-ordination. In many cases signalling equipment is lavish, particularly at wayside stations. In certain other cases however additional interlocking of starting signals is required. An elaborate signalling school exists at Colombo which should be partially dismantled. Further training of signalmen should be given in the signal boxes themselves. The Railway Signal Engineer should be responsible for all signalling, both mechanical and electrical, but having regard to the conditions on the Ceylon Railway, he should remain on the staff of the Engineer, Way and Works. Remodelling of the signal equipment at certain stations is recommended, including the amalgamation of cabins, switching out cabins at night, use of ground frames, etc.

Mechanical Engineering and Stores

Well-designed shops with modern equipment for general repairs exist at Ratmalana, near Colombo, but certain intermediate repairs are carried out at three outstations where the equipment is older and less economical than at Ratmalana. When an extension, which is now in progress, to the locomotive lifting shop at the latter point is completed, all intermediate repairs should be dealt with there, after which nothing beyond running repairs should be undertaken elsewhere.

Delays occur in issuing stores priced vouchers with a result that departmental costs are not available promptly. Improved methods are required to ensure that material drawn in excess of requirements is returned. Whilst the Mechanical Engineer's store at the main workshops is under the control of the Railway Storekeeper, the stores in the Engineering and other departments are under the control of those departments. It is recommended that the storekeepers in charge of these stores should be on the staff of the Railway Storekeeper and that the stocks held should remain in his charge until actually issued.

Accounting and Staff

It has been mentioned earlier that operating statistics require to be rendered more promptly, and that this should be done centrally by the Chief Accountant with the aid of mechanical appliances. It is noted that proposals to this end were put forward in 1930, but were refused by the Treasury on the ground that staff would be displaced and could not be absorbed elsewhere.

An important section of the report is devoted to staff questions. Ways are indicated in which staff can be reduced, for example, in the matter of firemen, guards, and station and office staff. The rates of pay on the railway are much higher than those in force outside. In addition to higher rates of pay the railway staff enjoys generous conditions of pensions, gratuities, paid leave, quarters, and cheap travel. Despite this the railway clerical service is suffering from a sense of grievance in regard to promotion. This is attributed to the fact that its members have been regarded as Civil Servants and consider they should be treated in the same way as those of other branches of the Civil Service, irrespective of the finances of the railway. The commission recommends that all posts should be classified. If the railway is to have a fair chance under the competitive conditions existing it must reduce its paybill; the existing rates of pay were fixed by the Government. A committee should be set up in Ceylon consisting of the General Manager, two members of standing in commercial life, the Chief Accountant of the railway, and one other railway officer, to draw up scales of pay and conditions of service for each grade, which should be applied to all new entrants. The compulsory retirement of many officers cannot be avoided. As mentioned later, certain sections of the line are recommended for abandonment. The Government should take over the payment of certain commitments in respect of pensions. Real loss occurs through malaria, and energetic efforts should be adopted for malaria prevention. This proposal was put forward in 1920, but the Government decided that it was impossible to differentiate between the railway and other departments.

Other Recommendations

Various proposals are made for the abandonment of sections of the railway which it is considered are uneconomical. The report states that as the railway is in need of extensive internal re-organisation, demanding study and knowledge, it is not desirable that it should launch out into other forms of transport. It should, however, enter into agreements with road transport firms of good standing for through booking of passengers and goods.

Proposed Re-organisation

The railway should be divided into two divisions on the divisional system, each in charge of a Divisional Transportation Superintendent, who will be in charge of traffic operating and running sheds, and be responsible to a Superintendent of the Line. On the civil engineering side, the line should be divided into three districts instead of five as now. No change should be made with regard to the Mechanical Engineering Department. The commercial work should be entirely separate from the operation of traffic, and be placed under a Chief Commercial Assistant to the General Manager, recruited from the local commercial community, and assisted by six or seven Commercial Assistants.

Depreciation and Renewals, and Finances

Prior to 1928-29 the Ceylon Government Railway made no provision for depreciation or renewals, the cost of replacements of any financial year being included in the estimates. In that year a renewals fund was started, but in October, 1932, the balance of Rs. 2,000,000 standing in the fund was appropriated to the general revenue of the island, and the renewals fund now exists only in name. A definite renewals fund should be created in order that the railway may be organised on true commercial lines. Had this principle been adopted in the past, the railway would have been in a better position to resist depression and competition. The railway accounts should be completely divorced from those of the Government, and capital readjustments, details of which are given, are necessary in order to put the railway finances on a sound basis.

It is considered that if energetic steps are taken by the railway to reduce expenditure and to "sell its wares," and if effective control over road transport is enforced, the financial results of the railway will considerably improve.

Control of the Railway

The commission reviews the disadvantages of direct Government control and recommends that a Railway Board should be set up consisting of five members, two elected by the Council of State and two nominated by the Governor, with the General Manager as Chairman. This board would exercise control of *inter alia* rates and fares. A high salary (for a Crown Colony Railway) is recommended for the General Manager, and the commission points out that when the right man has been obtained, it would be a mistaken policy to curtail his initiative and hamper his work by unduly restricting his powers, as would be the case if the existing relations between the railway and the different Government departments and the political organisation were maintained. Young Ceylonese officers should be given experience on other

colonial railways so that they can return to the Ceylon Railway with a wider experience than if they had remained there.

Control of Road Transport

Reference has already been made to the chaotic conditions under which road transport is operating in Ceylon, and to the necessity for a central controlling authority. It is recommended that this authority should consist of four members, of whom the Chairman should be solely engaged on the work and receive a salary commensurate with his responsibilities. A responsible Secretary, whose duties will be numerous and complex should be appointed. The commission emphasises the importance of the fact that the central authority should be of such a standing that its decisions will command respect and its impartiality be above suspicion, and that the first interest to be considered is that of the public. The central authority before granting or renewing a licence " should take into consideration the needs of the public for transport along the proposed route, and the possibilities of the development of the traffic, taking into account at the same time the facilities offered by other means of transport, such as the railway, and desirability of eliminating wasteful competition." The functions of the central authority are dealt with in detail in the report and the following are some of the points touched on:—

(*a*) The existing methods of registration and licensing should be transferred to the central authorities as well as driving certificates and periodical examinations of lorries and buses.

(*b*) Driving licences which now hold good for life should be renewed annually.

(*c*) If possible, educational standards should be introduced so as to raise the type of persons in charge of road vehicles.

(*d*) Third-party insurance should be introduced.

(*e*) Hours of work of drivers should be restricted by legislation.

(*f*) The rates and fares to be charged should be the responsibility of the central authority (the principles to be applied are discussed).

(*g*) The central authority will be responsible for the control of the number of vehicles utilising any given route.

(*h*) Private owners of lorries or buses should be treated in the same manner as road transport undertakings.

(*i*) The island should be split up into areas for licensing purposes.

Taxation and Enforcement of the Law

No change in the taxation of road vehicles is recommended, and an interesting table of expenditure on roads and road traffic, and receipts from taxation is given. Any attempt to make it a function of the central authority to enforce the law is deprecated. The enforcement of the law should be in the hands of the police, who should be empowered to compel any vehicle which appears to be in a dangerous condition to be taken before an authorised examiner, and this arrangement should include private vehicles. The central authority, which would be a judicial or quasi-judicial body, would take into account decisions given by the courts and consider such conditions when dealing with licensing renewals or annulments.

At present the police experience difficulty in enforcing the existing regulations, particularly for want of mobile police. The punishments inflicted are small. The proposals will place an added burden on the police employed on road duties and their numbers will have to be increased. The section of the report which is only briefly summarised here under the heading " Control of Road Transport " represents a complete scheme for proper organisation and administration.

The Ton-Miling of Coal Class Traffic

FROM time to time the Minister of Transport requires the railway companies to compile ton-mile statistics of various commodities conveyed by railway, indicating the tonnage, gross receipts, and receipts per ton-mile at each mile of distance. The most recent figures of this description which have been published by the Minister are those relative to coal, coke, and patent fuel traffic conveyed by the four main-line railway companies during March, 1936. As the previous ton-miling of these traffics was carried out in March, 1928, a comparison of the figures is of considerable interest, seeing that the mining and marketing of coal, in connection with which transport plays such an important part, constitute one of the principal industries of the country. One of the outstanding features of the figures is that 9,840,506 tons of landsale coal class traffic were conveyed in March, 1936, representing a decline of 761,679 tons or 7.2 per cent. compared with March, 1928; while 4,875,081 tons of shipment traffic were carried, a decrease of nearly 1½ million tons or 22·5 per cent. compared with the 1928 figure.

So far as the landsale traffic is concerned, 72 per cent. or 7,102,458 tons were conveyed in owners' wagons in March, 1936, and the balance of 2,738,048 tons in railway companies' wagons. Of the landsale traffic conveyed in owners' wagons, nearly four million tons were hauled by the L.M.S.R., and almost two million tons by the L.N.E.R. The average receipts per ton-mile for all companies were the same as in 1928, viz., 1s. 11d., but as the average length of haul dropped from 55·51 miles in that year to 52·50 miles, the average receipt per ton in 1936 was 4s. 10d. as compared with 5s. 1d. in 1928. With regard to the landsale coal class traffic conveyed in railway companies' wagons, more than half the tonnage originated on the L.N.E.R. system, nearly one million tons being carried in that company's North-Eastern area alone. The average receipts per ton-mile of all companies under this head were 1s. 51d.; a decrease of ·04d. as compared with March, 1928; but as the average length of haul increased from 31·97 miles in that year to 32·69 miles last March, the average receipt per ton proved to be identical with the 1928 figure of 4s. 1d. per ton.

Of the shipment coal, a total of 2,613,988 tons was carried in owner's wagons, and 2,261,093 tons in railway companies' wagons, the G.W.R. conveying slightly over half the former tonnage, and the L.N.E.R. over two million tons of the latter. The average receipts per ton-mile for shipment traffic conveyed in owners' were 1·04d. as compared with 1·03d. in March, 1928, and as the average length of haul also increased from 27·27 to 28·66 miles, the average receipt per ton increased by 2d. from 2s. 4d. to 2s. 6d. per ton. For shipment traffic carried in railway companies' wagons the average receipts per ton-mile rose from 1·72d. in March, 1928, to 1·75d. but as the average length of haul declined from 13·81 to 12·75 miles, the average receipt per ton showed a drop of 2d., from 2s. 0d. to 1s. 10d. per ton. It may be added that the lowest average receipt per ton for shipment coal conveyed in railway companies' wagons was in the North-Eastern area of the L.N.E.R., where the figure was 1s. 6d. per ton, while the lowest average figure for shipment coal conveyed in owners' wagons was 1s. 9d. per ton on the G.W.R. system.

A NEW L.M.S.R. PAINTING PROCESS

The new C.R. coach finish, developed at the Derby Research Laboratory, has exceptional durability that withstands the drastic cleaning processes necessary for rolling stock

(*See also editorial note on page* 1099)

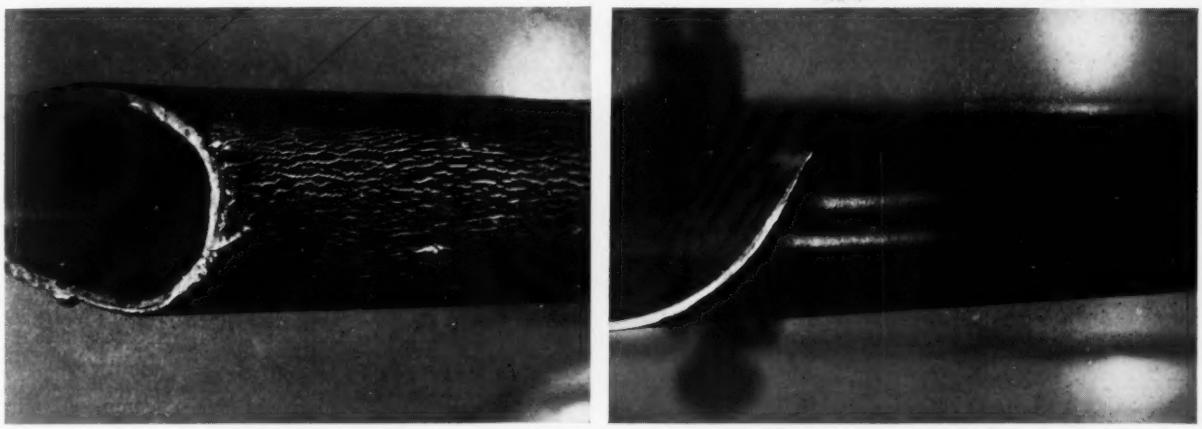
THE most common cleaning process for rolling stock is to wash the paintwork at stated intervals with a fairly strong acid solution. Although less severe cleaning methods have been suggested and adopted in certain cases, this drastic though effective treatment is still largely used on account of the particular type of grime which has to be removed, and it is for a finish capable of withstanding these conditions over a prolonged period that the paint technologist is continually seeking. This is only one aspect of the problem, however, and the application of the materials coupled with improved durability and flexibility is the goal which is continually being sought.

With these objects in view, the paint laboratory of the L.M.S.R. Research Department has been occupied over a period of years in assessing the faults of processes, and in exploring possible remedies for failures which have occurred. In doing this the faults of all the better known types of finishes have been carefully analysed and classified under their respective headings, and it has thus been possible to obtain data from actual service conditions which would not otherwise have been available. During the same period painting developments such as improved varnish or enamel coatings have been explored, as well as the nitrocellulose finishes and the much more recent types of synthetic resin enamel.

Service tests have revealed some predominating fault essentially peculiar to every one of these materials. Research was, therefore, undertaken with the object of combining, if possible, all the desirable properties of the finishes previously indicated, together with certain other factors which are essential for the satisfactory utilisation of the completed process, such as greater initial hardness to offset cleaning difficulties, improved flexibility and adhesion, longer durability than had previously been obtained, combined with greatly reduced drying times to facilitate output.

The development of such a process calls for considerable experimental work before even the various points of advantage could be arranged on a satisfactory basis for future exploration. It was found, however, that a satisfactory combination of vegetable drying oils, natural gums, and a specially selected nitrocellulose, together with a new type of modified synthetic resin, could be adjusted to form the essential binding medium for the process, and this has now been developed on an extensive scale. This rather remarkable material can be applied only by spraying, and it has been found during actual works tests under average shop conditions that as many as five or six coats can be satisfactorily applied during the working day.

The L.M.S.R. has many all-steel carriages in service with the exteriors finished throughout with this material, which has been styled the C.R. process. In addition, 50 locomotives have also been treated, and a certain number of road motor vehicles. These finishes in all cases are a pigmented type in accordance with the standard L.M.S.R. colour schemes. The material has also been adopted for use as a clear varnish with the object of superseding existing types of clear wood finishing materials for interior decoration, and up to the present 30 vehicles have been treated with excellent results.



A striking demonstration of the flexibility and adhesion of the C.R. process. Two panels, aged for nine months after painting, are seen bent double; that on the left, treated by ordinary methods, exhibits a considerable fracture, in contrast with the smooth finish of the C.R. panel on the right

Once the formulation had been agreed upon there were of course many manufacturing difficulties which had to be overcome before the material could be produced in a commercial form, and in this respect the L.M.S.R. is indebted to Docker Brothers of Birmingham for the co-operation and assistance given in covering the details surrounding actual manufacture. It will be appreciated in the development of a material of this class, and its application to modern railway conditions, that its success and general adaptability are in no small way dependent on painting conditions being brought up to a higher standard of efficiency than was hitherto necessary in railway workshops. Control of temperature and other factors influencing drying times require very serious consideration, and since the success of the process is entirely dependent on its being spray applied, it will be realised that extensive developments are necessary to ensure satisfactory application.

LONG DISTANCE SIGNAL AND POINT OPERATION

"Semi-independent" interlockings on the Eastern Railway of France

As soon as power signal and point operation had reached a satisfactory degree of reliability, which it did many years ago, it became obvious that there was theoretically no limit to the distance at which it could be made effective, and hence no limit to the degree of concentrated control which might be attained by its use. Local circumstances would, of course, impose certain limitations on the size of signal boxes, apart from purely technical considerations, but the working of points and signals many miles from the actual controlling point was obviously possible, given safe methods of locking and detecting. Nevertheless the cost of long distance working was bound to remain prohibitive as long as the ordinary power signalling circuits were used, as they entailed the running of independent circuits to serve each function. The cost of installing and maintaining the line wires, or wires in cables, was considerable when distances were great.

It later became possible to conduct the controlling currents for a number of appliances in a very few wires, and so bring the points and signals at many places along the line under the control of a single operator, without a heavy outlay for electric conductors being necessary. The success of these centralised control systems has been most marked, especially in the United States, where the conditions are peculiarly favourable to their use, while in Great Britain, between Wembley Park and Stanmore, and in France, between Houilles and Sartrouville, installations have been made as described in our issues of March 17, 1933, and June 8, 1934.

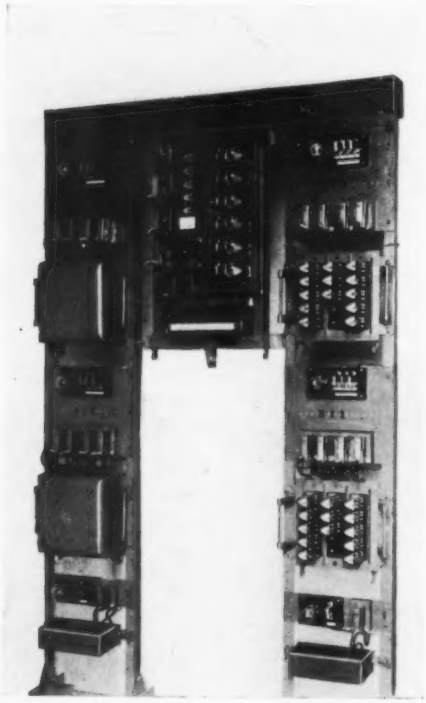


Fig. 1—View showing route relay groups, or units, and selector switch

The Chemins de fer de l'Est, on which a large amount of automatic signalling has been installed since the war, and where the remarkable Descubes route-lever power system has been extensively applied, have now introduced a system of long-distance control, at several places. We have received from M. A. Vinot, Ingénieur Principal, Chef du Service des Études de l'Exploitation, the accompanying illustrations of the apparatus, which have already appeared in a descriptive article in our contemporary, the *Revue Générale des Chemins de fer*, from which, also, we reproduce our diagrams.

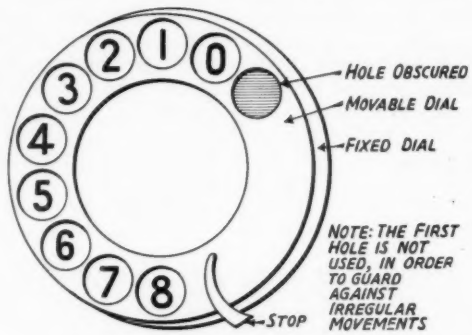


Fig. 2—Dial selection for emergency use

The system is described as *postes semi-autonomes*, or semi-independent interlockings, because at each location it forms a kind of signal box which can be worked by a person at that place if necessary, but which is normally set in action, train movement by train movement, by the signalman at some distant point. Each *poste* is thus self-contained, and embodies in itself the complete equipment necessary to ensure the correct setting, locking and detecting of the functions allotted to it, the mechanism being all-electric. The route working principle is adhered to, applied in a manner similar to that general in France, where it has long been popular.

Principles of Working

Each route within the area included in a given semi-independent equipment, which may be termed an outlying location for convenience, is governed by a set of relays called a route unit or group, (*bloc itinéraire*), the function of which is to set up that route and clear the relative signals on receipt of an impulse from the controlling signal box, and it can be returned to its original condition by another, or cancelling, impulse sent from the same place. The same effect can be produced locally by operating a setting and a cancelling push-button. Thus the operations of the mechanism, once started by an initial impulse, perform themselves automatically until complete, assuming conditions are right for them to do so. Electrical interlocking circuits between the various route units and the relays in each one enable all the fundamental requirements of safe signalling to be met, so that in these respects the outlying location is as efficiently locked as any ordinary signal box. Approach locking, point locking, and semi-automatic signal control are provided in the usual way.

In Fig. 1 four such units can be seen, together with the selector switch which decides which one shall, for the time being, be connected to the distant signal box.

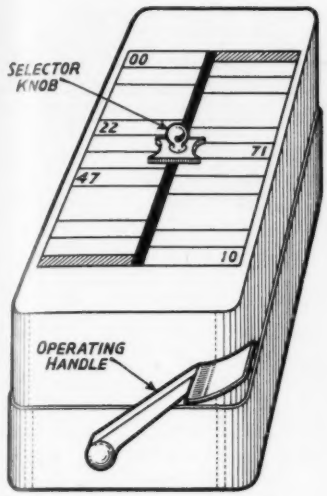


Fig. 3—The Telerapid selector apparatus for regular operations

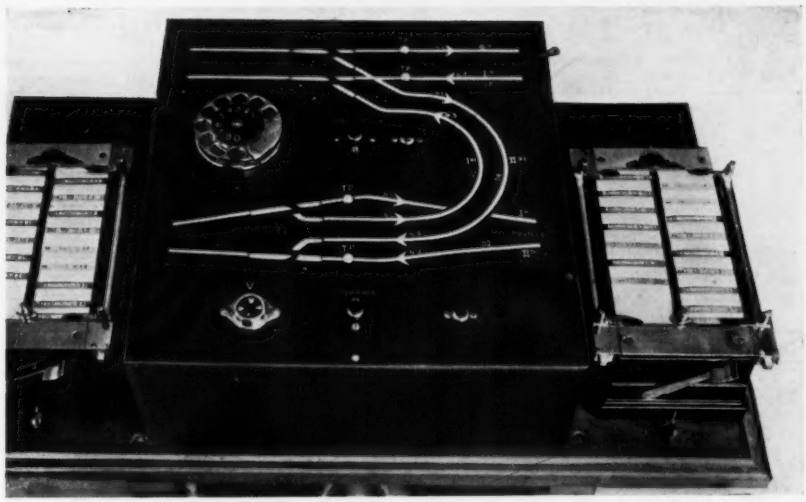


Fig. 4—Signalman's diagram and operating board showing Telerapid apparatus

This switch is operated over an ordinary circuit by means of impulses sent out by a telephone dial, as illustrated in Fig. 2, or by a telerapid apparatus, similar to that used for dialling telephone numbers which are frequently required (Fig. 3).

Owing to its convenience and perfectly regular action, the telerapid system is used for all ordinary purposes, the dial being kept as a stand-by. It will be noted that the first hole in the dial is not used, and that the numbers are inscribed differently from telephone practice. This is so that the numbers given to the signalman for the various moves may be chosen in the most convenient manner, but the apparatus naturally translates them into something else electrically. The use of the telerapid instrument makes the signalman's work very simple, and the position of the sliding knob is a clear indication to him of the movement intended. Actually there are 50 possible positions of the knob, corresponding to twenty-five inscriptions on each side of the slot, staggered with respect to each other; in order to reduce the possibility of mistake, two-thirds of the positions are not used. Thus, in Fig. 3, the knob is opposite signal 71, and on the other side of the slot the spaces are left unused, so that there are two blanks separating 22 and 47. The telerapid instrument is clearly seen in Fig. 4 at the side of the signalman's diagram board, with the various push-buttons and the return indicator marked V. The dial is numbered on the original plan, now superseded by that shown in Fig. 2.

After operating the telerapid (or dial), the signalman presses the setting button and receives an answer on the indicator if the action is effective. To cancel the action, he again manipulates the telerapid (or dial), in the relative position, and uses the cancelling button. Positions on the telerapid are allocated to the regular moves and to some special functions that may occasionally be required, such as ascertaining the condition of certain units, track circuits or signals, at the outlying location, which can be explored by selecting with the telerapid and operating a suitable key.

In some cases it is advantageous to have complete automatic working at certain locations, as if there was no signal box control. To start this working the appropriate setting is made from the box, after which the route remains set and locked in permanence, the signals working automatically as trains pass and clear the track circuits concerned. Generally speaking points remain in the position assumed for a movement, even after it is cancelled, as is usual in route working, but where essential for safety, restored points are installed, which return to a definite normal position. As explained, the working can be carried out by a person on the ground, if desired, and Fig. 5 shows the interior of the operating room at a location. At times, where special train movements have to be dealt with, it is found advantageous to work in this way, and when a location is so opened the working is quite independent of the distant control. It thus resembles a signal box which, when closed, has its functions transferred to another one some distance away.

Any kind of power-worked signal can be adopted with this arrangement, but in most cases colour-light signals,

Fig. 5—Interior of operating portion of an outlying location showing indicators, operating buttons, and train describers

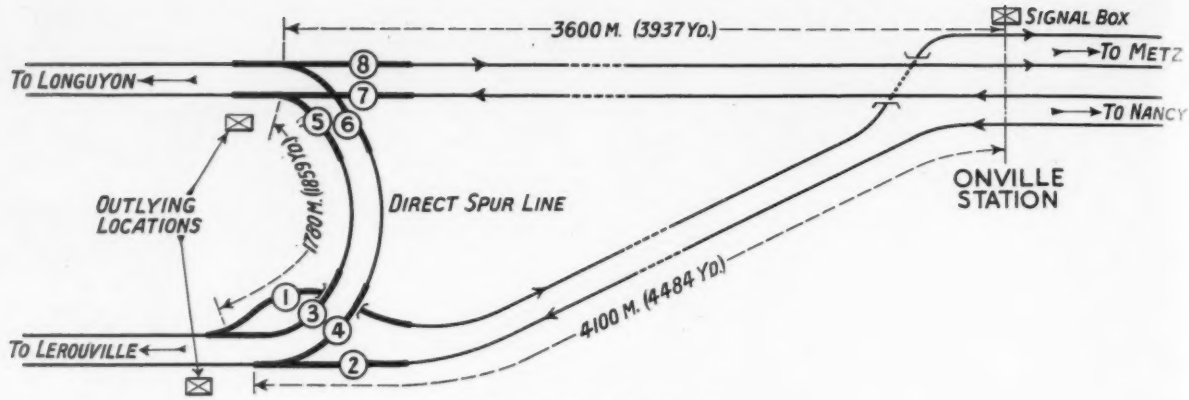


Fig. 6—Onville spur line

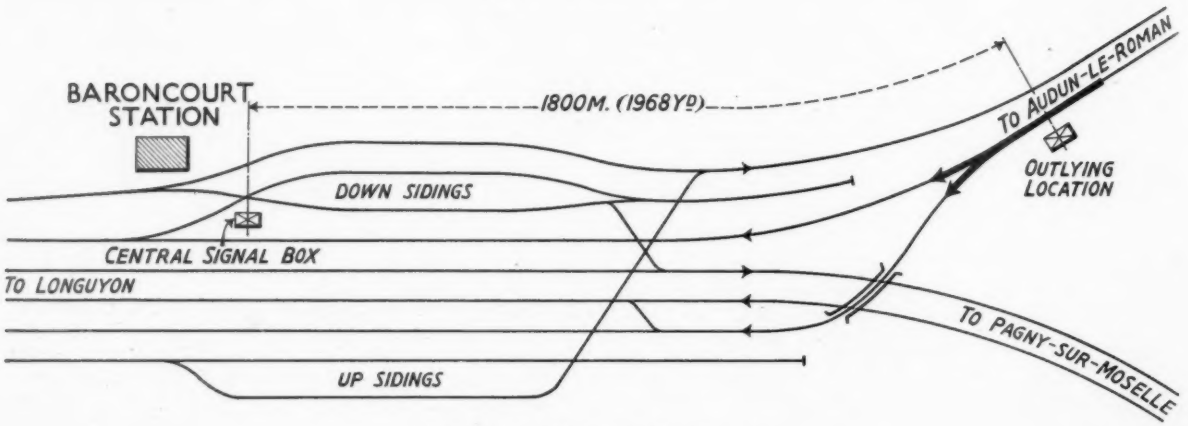


Fig. 7—Junction near Baroncourt

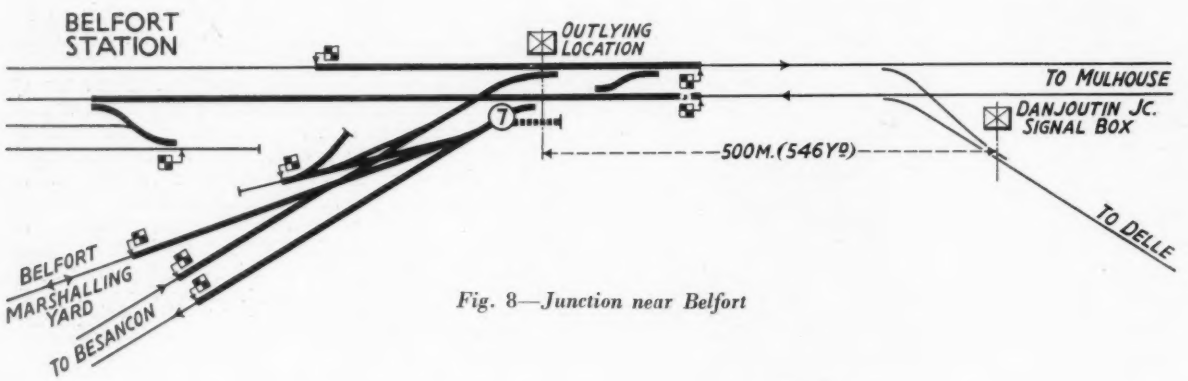


Fig. 8—Junction near Belfort

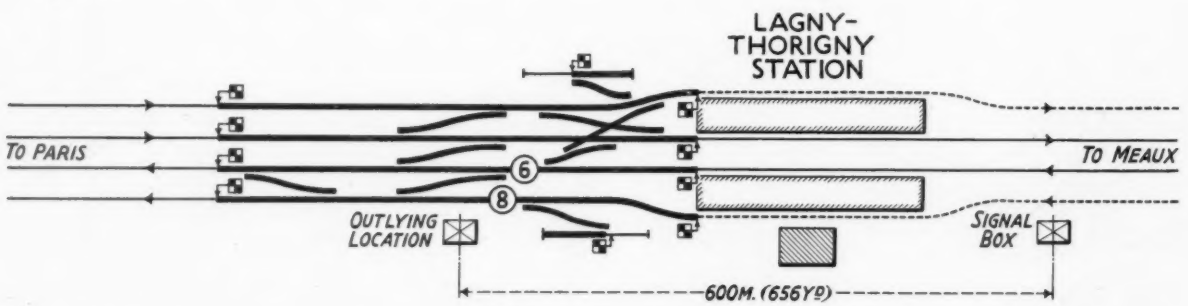


Fig. 9—Crossovers at western end of Lagny-Thorigny station. Outlying location temporarily in use as signal box

approach-lighted, have been used. Telephones are provided between the outlying locations and the controlling point, so that trains stopped there can communicate and receive instructions. Should all communication or control break down, the location can still be worked on the ground as an independent signalling point in the manner described. Hand working of points in case of total failure can, of course, be resorted to, and to reduce risks of damage and ensuing delays, trailable point equipment is generally used. The type of power supply is largely a matter of convenience, and of whether a reliable external supply is readily available. If not, primary batteries may be used.

Practical Applications

Figs. 6, 7, 8, and 9 show some interesting examples of this method of controlling outlying locations. The first is on the connecting spur near Onville, where the Longuyon and Lérouville lines converge. In this case there are two outlying locations controlled from Onville station box by the board illustrated in Fig. 4. Primary batteries are used for the facing point motors, but current from the mains for the rest of the working; a reserve generating set is provided at Onville. This installation was brought into use on April 25, 1934.

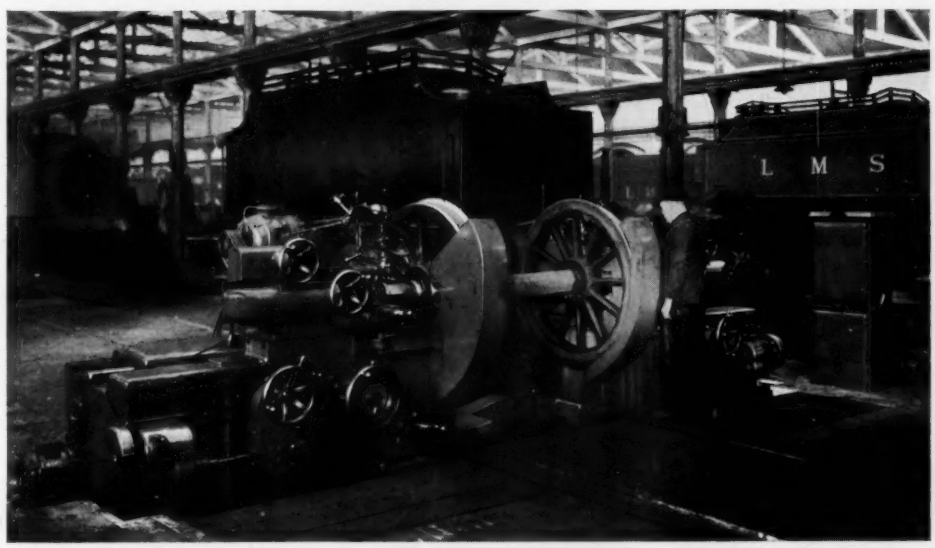
On May 27, 1935, a simpler one was put to work at Baroncourt, as shown in Fig. 7. In this case the points on the Audun-le-Roman line are controlled from the power cabin in the station, and the whole of the apparatus is worked by primary batteries. Fig. 8 illustrates the junction near Belfort where the line branches off to Besançon and connects with the Belfort yard. There are a good many movements possible, but by dividing the routes into zones, either side of a common point, a small number of route units has been made to do all the work. There are 14 points and 24 regular routes, controlled from the Saxby type mechanical cabin at Danjoutin Junction, about 500 m. distant. This installation has been working since November 15, 1934.

Finally in Fig. 9 is seen the apparatus used at the western end of Lagny-Thorigny station, not far from Paris, where arrangements were made for 18 pairs of points and 30 routes to be controlled from the outlying location itself, pending the construction of a new electric power box at the eastern end of the station.

We are informed by M. Vinot that the working of this apparatus has proved quite satisfactory, and that it is intended to extend it wherever it will enable savings to be made and the working to be concentrated in fewer signal boxes.

REGRINDING AXLE JOURNALS

WE illustrate* an axle journal regrinding machine recently installed at the Crewe works of the L.M.S.R. for machining the outside journals of carriage, wagon, and tender wheel sets. This machine, which is located in the tender repair shop, is a product of the Churchill Machine Tool Co. Ltd., Manchester, and is shown regrinding journals of tender wheels. The wheels illustrated have journals $5\frac{1}{2}$ in. diameter by $10\frac{5}{8}$ in. long, with fillets $1\frac{1}{2}$ in. radius. The travel of the wheelhead is 9.2 in. a minute with a feed of 0·000625 in., and the speed of the wheel is approximately 5,000 ft. per min. The average amount of metal removed is $\frac{3}{32}$ in. on diameter. The fillets are machined with high-speed steel tools at a speed of 5·5 r.p.m., and the average amount of metal removed is $\frac{3}{32}$ in. The floor-to-floor time for this class of wheel is 3 hours.



A Churchill machine regrinding journals of tender wheels in Crewe works

The efficiency of the machine for grinding makes it possible to deal with practically the whole of the reconditioning work on the journals by grinding alone, even when journals come to the machine in a scored condition. The machine is equipped with hand-operated turning slides on each head for use when very badly scored journals have to be dealt with. The design incorporates a hydraulic jack, making the machine independent of overhead cranage. It is necessary only to roll the wheel set straight into the machine and operate a single lever, bringing the wheels automatically to the centre height ready for insertion of the centres. Automatic chocks come into operation as the wheel set is lifted, and these prevent rolling from the centre position.

The two heads carry 20 in. diameter by 5 in. wide grinding wheels, and a radius truing device, integral with each head, is provided for truing the edges of the wheels to the required radii of the fillets, which are ground at the same time as the journals. The grinding wheelheads embody the Churchill patent Hydrauto bearing adjustment.

* By courtesy of Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R.

Above : Two views of work on erecting a new roof for the avalanche tunnel, Penmaenmawr, L.M.S.R. (see editorial article on page 1102)

Right : Mr. William Whitelaw, Chairman of the L.N.E.R., speaking at the opening of an exhibition of the company's locomotives and rolling stock at New Barnet on June 5. Sir Philip Sassoon is on Mr. Whitelaw's right (see page 1097)

Left : Train of old carriages, destined for Compiègne Carriage Museum, in which International Railway Congress delegates were conveyed between Le Landy and La Chapelle, Paris (see last week) *; and* (right) *Sir Nigel Gresley and M. Lancrenon at the new La Chapelle diesel railcar depot of the Nord*

RAILWAY NEWS SECTION

PERSONAL

Sir Josiah Stamp, Chairman of the L.M.S.R., received the honorary degree of LL.D. at the spring convocation in Montreal of the McGill University, when he delivered the commencement address on "The Institution of Modern Society." Sir Josiah has also been awarded the honorary degree of LL.D. by the Western Ontario University. He and Lady Stamp will be returning to London towards the end of this month.

Major Martin P. Sells, O.B.E., M.I.Mech.E., M.Inst.Loco.E. M.Inst.T., has retired from the post of Chief Mechanical Engineer on the Nigerian Railway, and is taking up the post of Chief Mechanical Engineer to the Rhodesia Railways at Bulawayo. He has been acting as General Manager of the Nigerian Railway while Mr. McEwen has been on leave. Major Sells is now in England on leave.

Mr. F. B. Simpson, M.P., a former Lord Mayor of Leeds and President of the Railway Clerks' Association for the past few years, has been appointed Chief Assistant Secretary of the association in succession to Mr. George Lathan, J.P., M.P., who has just retired. As announced last week, Mr. F. Watkins, M.P., has taken over the presidency of the association.

L.N.E.R. Appointments

The L.N.E.R. announces that the following appointments have been made:—

Mr. L. H. K. Neil, Assistant to the Continental Traffic Manager, to be Assistant Continental Traffic Manager.

Mr. F. C. C. Stanley, Suburban District Goods Manager, King's Cross, to be District Passenger Manager, Newcastle.

Indian Railway Staff Changes

Mr. B. Moody, M.A., M.Inst.T., V.D., Secretary to the Railway Board, has been selected to officiate as Chief Operating Superintendent, N.W.R., in place of Mr. D. H. Furley, who has proceeded on leave preparatory to retirement, as noted in our issue of May 21.

Mr. B. L. Cameron, Deputy Agent, Personnel, N.W.R., has been appointed to succeed Mr. Moody as Secretary to the Railway Board.

Mr. H. G. Cabrett has retired from the position of Chairman of the Local Board of the Cordoba Central Railway at Buenos Aires, a position he has held since 1931. On his appointment as Chairman, Mr. Cabrett had already been associated with railway management in Argentina for some 43 years, his first appointment, as Assistant General Manager of the Argentine Great Western Railway, having occurred in 1888. In 1891 he also took over the managership of the Transandine Railway, which was then under construction, and during his control of the latter concern the first five sections of the line, comprising about 60 miles, between Mendoza and Upsallata, were opened to service. In 1892, Mr. Cabrett joined the Central Argentine railway, occupying in succession the posts of Acting Traffic Superintendent, Assistant General Manager, and (following the fusion of the Central Argentine and Buenos Ayres & Rosario Companies in 1902) that of General Superintendent of the combined lines. Towards the end of 1911 he resigned from the Central Argentine Railway, and early in 1912 he accepted an invitation to become General Manager of the Argentine Railway Company (Farquhar Syndicate), which held a controlling interest in the Cordoba Central Railway, Entre Rios Railways, Argentine North Eastern Railway, Rosario to Puerto Belgrano Railway, and a number of industrial concerns. For the ensuing three years Mr. Cabrett exercised a controlling supervision over the management of these undertakings, and undertook the actual management of the Cordoba Central and Rosario-Puerto Belgrano Railways. On the outbreak of the war in 1914 the Argentine Railway Company was dissolved, and Mr. Cabrett thereafter continued as General Manager of the Cordoba Central Railway, which position, as also that of Manager of the Rafaela Tramway Company, he occupied until appointed Chairman of the Local Board of the Cordoba Central Railway as from February 1, 1931. Mr. Cabrett was for some years Chairman of the Argentine Railway Clearing House, and at one time a member of the Argentine Government Commission on bridges and roads giving access to railway stations, and of the commission appointed to investigate the advisability of adopting automatic couplings on Argentine railways.

Mr. H. G. Cabrett,
Chairman, Local Board,
Cordoba Central Railway, 1931–37

On April 2, Mr. Cabrett was entertained to luncheon at the Jockey Club, Buenos Aires, by the Board of Representatives and Members of the Argentine Railways. Those present were:—

Doctors G. E. Leguizamon, O. Rocha, E. F. Cárdenas, A. N. Matienzo, Luis P. O'Farrell, Angel Sánchez Elia, and Teófilo Lacroze; Engineers Atanasio Iturbe, F. Sisqué, G. J. White, E. Chanourdie, and P. Paissaud; Messrs. J. Calder Angel, F. A. Bottomley, F. Garaycochea, O. Loewenthal, M. F. Ryan, D. M. MacRae, H. Bustos Morón, C. P. Billings, J. Wilson, and C. E. Trench.

Mr. K. C. Marrian, who, as announced in our issue of May 14, has been appointed District Engineer, Manchester (Exchange), L.M.S.R., was until 1920 in the District Engineer's Office, Derby, of the former Great Northern Railway. In that year he was transferred to the Engineer's Office, Liverpool, Cheshire Lines Committee, under Mr. A. P. Ross, becoming Resident Engineer, Cheshire Lines Committee, on the appointment of Mr. Ross as Chief Stores Superintendent, L.N.E.R. As Resident Engineer, Mr. Marrian's jurisdiction embraced the civil, electrical, signal telegraphs, and outdoor machinery services. In his new appointment at Manchester, which follows

upon the taking over of the C.L.C. Engineering Department by the L.M.S.R. (see THE RAILWAY GAZETTE of February 19), Mr. Marrian retains the civil engineering of the Cheshire Lines from Warrington to Manchester, and Godley; and from Altrincham to Chester. Mr. Marrian served with the Royal Engineers during the war, first with the Hampshire Fortress Company, and later with the Railway Construction Troops in France. He is an Associate Member of the Institution of Civil Engineers.

Photo] [Lafayette

Mr. K. C. Marrian,

Appointed District Engineer, Manchester (Exchange), L.M.S.R.

Mr. B. Moody, M.A., V.D.,

Appointed to officiate as Chief Operating Superintendent, N.W.R. (India)

Mr. J. Ness,

Appointed Assistant to the Divisional General Manager (Traffic), Scottish Area, L.N.E.R.

Mr. F. C. C. Stanley,

Appointed District Passenger Manager, Newcastle, L.N.E.R.

Mr. A. W. S. Graeme,

Chief Mechanical Engineer, Federated Malay States Railways, 1932-37

Mr. S. W. Moore,

Divisional Engineer, Bristol, G.W.R., 1929-37

Mr. Basil Moody, M.A., M.Inst.T., V.D., who, as announced on page 1123 this week, has been appointed to officiate as Chief Operating Superintendent of the North Western Railway, India, in place of Mr. D. H. Furley, now on leave preparatory to retirement, was born in 1889 and educated at Marlborough and St. John's College, Cambridge. He joined the N.W.R. as an Assistant Traffic Superintendent in January, 1912, and served during the war in France from 1915 to 1919, after which he rejoined the railway as a District Traffic Superintendent. In 1926 he was appointed Deputy Director of Traffic and Statistics with the Railway Board, but in 1929 returned to the N.W.R. as Divisional Commercial Officer. In 1934 Mr. Moody was promoted to officiate as Divisional Superintendent, but in the following year he was selected to officiate as Secretary to the Railway Board, the position in which he was confirmed in 1936. It is this post that he has now relinquished to officiate as Chief Operating Superintendent, N.W.R.

Mr. J. Ness, whose appointment as Assistant to the Divisional General Manager (Traffic), Scottish Area, L.N.E.R., was recorded in our issue of May 7, started his railway career in Scotland, and then moved south to the North Eastern Area and to the Chief General Manager's Office. In 1929 he became head of the docks section in the District Goods Manager's Office, Hull, and three years later he returned to Scotland as Chief Assistant to the District Goods & Passenger Manager at Dundee. Mr. Ness is an Associate Member of the Institute of

Transport, and a Vice-Chairman of the Scottish Branch of the institute. This appointment is additional to that of Mr. F. W. Lamb, who remains at Edinburgh as Assistant to the Divisional General Manager, Scottish Area.

Mr. F. C. C. Stanley, who, as announced above, has been appointed District Passenger Manager, Newcastle, L.N.E.R., in succession to Mr. E. W. I. Arkle, was born in 1900 and educated at Birkenhead School and Pembroke College, Oxford. He joined the former North Eastern Railway at York as a Traffic Apprentice in 1922, and gained experience in the Commercial and Operating Departments at various places, in what afterwards became the North Eastern Area of the L.N.E.R. At the end of 1926 he was transferred to the Chief General Manager's Office as Assistant to the Industrial Agent, where he remained until appointed Assistant to the Goods Manager, Southern Area, at Liverpool Street in July, 1929. After serving for three and a half years at Liverpool Street, Mr. Stanley was appointed Acting District Goods Manager, Liverpool, in January, 1933. In July, 1934, Mr. Stanley succeeded Mr. H. A. Newman as London Suburban District Goods Manager at King's Cross, which position he now vacates. Mr. Stanley is a Captain in the 157th (L.N.E.R.) Docks Company, Royal Engineers, Supplementary Reserve.

Mr. A. W. S. Graeme, M.I.Mech.E., Chief Mechanical Engineer, Federated Malay States Railways, is shortly relinquishing his post on retirement. He was educated at Malvern, and the Durham College of Science, and after serving his apprenticeship and pupilage at the Crewe works of the London & North Western Railway, was for three years in the Running Department at the Rugby and Workington sheds. In 1909 he was appointed Assistant Locomotive Superintendent of the Great North of Scotland Railway in charge of the locomotive depot and motor services at Aberdeen, and in 1914 became Works Manager at Inverurie. The following year he accepted an appointment as Deputy Locomotive Superintendent of the Federated Malay States Railways, and became Locomotive Superintendent in 1924. In 1932 his title was changed to Chief Mechanical Engineer, consequent upon the introduction of the Transportation system of administration. During his term of office he has been responsible for the introduction of various types of locomotives, and in respect of rolling stock mention may be made of the air-conditioned coaches which went into service shortly after he left Malaya on leave prior to retirement.

Mr. S. W. Moore, who, as announced in THE RAILWAY GAZETTE of January 29, is retiring on Wednesday next, June 16, from the position of Divisional Engineer, Bristol, G.W.R., spent three years as a pupil under the late Mr. Kenneth Bayly, Chief Engineer of the Great Southern & Western Railway of Ireland, and was appointed Resident Engineer for a few years on coast defence works then being carried out by the Antrim County Council. Following the completion of this work, Mr. Moore was connected for short periods with railway schemes in Donegal. In 1898 he joined the New Works Department of the Great Western Railway at Paddington, where he remained until 1916, when he was transferred to the staff of the London Divisional Engineer. In 1917 he was appointed Chief Assistant to the Divisional Engineer at Taunton. In the spring of 1924 Mr. Moore was appointed Divisional Engineer, Neath, and was transferred to Bristol in a similar capacity early in 1929, whence he now retires.

L.M.S.R. APPOINTMENTS

The following appointments have been approved by the directors:—

Mr. N. L. Wallis, District Engineer, Abergavenny, to be District Engineer, Stoke.

Mr. J. Elliott, Assistant to District Engineer, Liverpool (Central), to be District Engineer, Abergavenny.

Mr. C. J. Chaplin, Assistant to District Engineer, Bangor, to be Assistant to District Engineer, Liverpool (Central).

Mr. J. Cunningham, Assistant, Divisional Engineer's Office, Glasgow, to be Assistant to District Engineer, Bangor.

Mr. J. E. Bagguley, Technical Assistant to Chief Mechanical Engineer, Euston, to be Assistant Works Superintendent, Derby Loco.

Mr. E. S. Cox, Assistant Works Superintendent, Derby Loco., to be Development Assistant, Chief Mechanical Engineer's Department, Derby.

Mr. A. R. Thomson, District Controller, Rugby, to be Outdoor Assistant to Divisional Superintendent of Operation, Crewe.

Mr. E. N. B. Jeffrey, Assistant District Locomotive Superintendent, Plaistow, to be Assistant District Locomotive Superintendent, Saltley.

Mr. H. A. Peet, Running Shift Foreman, Toton, to be Assistant District Locomotive Superintendent, Plaistow.

Mr. L. Mitchell, Assistant Goods Agent, Buchanan Street, to be Goods Agent, Greenock.

Mr. T. Harris, Clerk, Buchanan Street, to be Assistant Goods Agent, Buchanan Street.

The late Mr. Richard Edward Synge Cooper, whose death on May 4 we reported in our issue of May 7, began his railway career as a pupil at Crewe, L.N.W.R., under Mr. Footner, and was placed in charge of works in connection with the Standedge tunnel. In 1897 he joined the Lagos Government Railway at Lagos, but was invalided home with fever in 1898. Joining the engineering staff of the London, Brighton & South Coast Railway in 1899 Mr. Cooper was engaged on the survey and preparation of the contract drawings for the Croydon and Balham widening. In 1903 he was appointed Resident Engineer for the Victoria to Pouparts Junction widening, a work which included the reconstruction and widening of Victoria station, Grosvenor bridge over the Thames, the bridges over the L.S.W.R. main line, etc., and the viaducts down to Pouparts Junction, including Battersea Park station. On the completion of these works, Mr. Cooper was appointed District Engineer of the Northern Section of the L.B.S.C.R, with offices at East Croydon, finally becoming Chief Assistant to Sir (then Mr.) Charles L. Morgan. Mr. Cooper rejoined the L.N.W.R. in 1911 as New Works Assistant to Mr. E. F. C. Trench, at Euston, and remained in the same position with the L.M.S.R. until his retirement in 1929.

We regret to record the death at his home at Gosforth on June 5 of Mr. E. F. Wilkinson, who retired in June last year from the position of District Passenger Manager, Newcastle-upon-Tyne, L.N.E.R. Mr. Wilkinson's lengthy railway service at Newcastle—he was appointed District Passenger Manager there by the N.E.R. in 1902—was referred to in the illustrated biography of Mr. Wilkinson published, on the occasion of his retirement, in our issue of June 26, 1936.

Mr. S. T. Batley, a Director of Greenwood & Batley Limited, whose death was recorded in our issue of March 26, left estate valued at £25,266 (£23,601 net).

We regret to record the death in Buenos Aires on June 3, as the result of an accident when alighting from a train, of Mr. John A. Trench, Stores Superintendent, Buenos Ayres Great Southern & Western Railways. An illustrated biography of Mr. Trench appeared in our issue of January 15 last.

It is with regret we record the death on June 5 of Lord Kylsant, Chairman of the Royal Mail Steam Packet Company from 1903 to 1931, and a former director of the Southern Railway.

Mr. Robert Scorgie, who, as recorded in our issue of April 30, retired on that date from the position of Stationmaster at Glasgow (Central), L.M.S.R., was on May 28 handed a silver salver and a bank draft for nearly £600 by Sir Steven Bilsland, Bt., who described the number of subscribers to the presentation as an eloquent tribute to the place Mr. Scorgie had won in the hearts and minds of the travelling public. It will be remembered that further recognition of Mr. Scorgie's eighteen years at Glasgow (Central) was made by a presentation from his colleagues on the day of his retirement (see our issue of May 21).

The International Railway Congress in Paris

(From our special correspondent)

With the plenary meeting this morning the Thirteenth International Railway Congress comes to an end, after eight working days during which the thirteen questions under consideration have been discussed. Besides the meetings, numerous visits of inspection have been arranged, as well as excursions and social events. Finally, beginning this evening, long distance excursions are being provided by the French railways to enable the delegates to see some of the beauties and places of historical interest in France, as well as to give pleasant relaxation after a strenuous 10-day period in Paris, during which the weather has been brilliantly fine nearly all the time. Only on two or three days has there been anything approaching excessive heat. All the arrangements have worked well, and those responsible for the organisation of the Congress deserve congratulation.

Visits of Railway Interest

The numerous visits of railway interest arranged by the French railway administrations have afforded the opportunity of much useful instruction under the pleasantest conditions. In last week's issue mention was made of the visits to the locomotive testing station at Vitry, the Nord depots at Le Landy and Le Chapelle, and the psychotechnical laboratory of the Paris Transport Company (S.T.C.R.P.). No less interesting have been the subsequent visits and the supplementary exhibitions by some of the railways of their most recent rolling stock.

Up-to-Date Marshalling Yards

At the rebuilt Gare de l'Est,* over which parties of delegates were conducted, there was an exhibition of various types of railcar as used on the Eastern Railway. The delegates were then shown the extensive and up-to-date marshalling yards at Vaires, about 15 miles out on the Strasbourg line. Here, as at the Le Bourget down yard of the Nord, to which visits were also arranged, the electrically operated Deloison type of slipper brake is used to control the speed of wagons shunted over the humps. At Vaires, however, there is an interesting development of multiple shoes which the visitors saw in operation. There are two yards at Vaires on opposite sides of the main line, connected by tracks carried above the latter. Incidentally, the numerous elaborate flying junctions noticed on all the French railways were the subject of appreciative comment by delegates from countries where the railways are not so well equipped in this respect.

Point control and signalling at these modern Paris marshalling yards are mostly power operated, the route-lever system being generally favoured; communication between signalmen, controllers, shunters and enginemen is by wireless, and loud speaker. In connection with the latter, not only in these particular instances, but at the numerous stations where passengers are directed by loud speaker, the clear articulation of the Frenchman enables every word to be understood at once. This feature was particularly noted by delegates who visited the new Versailles—Chantiers station of the Etat, a striking example of modern railway architecture, convenient arrangement and up-to-date signalling.* Versailles is a residential suburb, as well as popular resort because of its historical interest, and the beauty of its setting, and an enormous traffic is handled by the State Railways at its three stations, two of which are terminals of electrified suburban lines. One of the latter, the Rive Droite station, has recently been modernised and is remarkable not only for its attractive appearance, but for its almost complete mechanisation.

Centralised Traffic Control

The centralised traffic control of the Etat between Houilles and Sartrouville on the Havre main line, was the object of yet another visit, and delegates were duly impressed by the efficiency with which this three-track section can cope with traffic peaks that under an ordinary signalling system would require four lines of way.† Control is exercised centrally from the St. Lazare terminus.

A Remarkable Permanent Way Depot

The central permanent way depot of the Nord at Moulin—Neuf, near Persan Beaumont, about 25 miles from Paris, was reached in one of the new three-car fast diesel-electric trains as used on the Franco—Belgian services. The depot covers an area of 65 hectares (160 acres), and is notable for labour saving equipment much of which is extremely ingenious, particularly the machinery for sorting and stacking used sleepers. The flash-butt welding of rails was seen in operation here, as well as the reconditioning of used rails by cutting off battered ends and re-drilling the fish-bolt holes all in one operation. The enormous point and crossing shop, equipped mechanically to the last detail, was an impressive sight. Here new and second hand work, in which a considerable amount of welding is incorporated, is done not only for the whole of the Nord system but for other railways as well. The perfectly organised stores, with an automatic stock-filing system, supply materials and apparatus used by the track, signal and building departments. The depot is completed by an apprentices training school.

Exhibitions of Rolling Stock

During the Congress period delegates have had the opportunity to inspect recent examples of French rolling stock at the Etat terminus of St. Lazare, the Gare de Lyon, the Gare de l'Est, and the Austerlitz station of the P.O.-Midi. There has been an exhibition of containers at the Batignolles depot of the Etat; and in the transport section of the International Exhibition, equipment as used on many European railways is to be seen. Space will permit merely of the mention of the displays arranged for delegates of modern railcars, typical of the latest phase of French railway operation; the streamlined steam trains and locomotives of the P.L.M., Etat, and P.O.-Midi Railways; the powerful main-line steam, electric and diesel locomotives (the latest the new 4,000 h.p. diesel-electric of the P.L.M.*); the examples of modern passenger rolling stock; and a most ingenious track testing train demonstrated by the P.O.-Midi between Paris and Juirsy.

A visit to the Gaillon works of Carel Fouché et Cie. to see the shot-welded construction of the new Etat stainless steel articulated railcars for the newly electrified Le Mans line was made by a number of delegates last Monday. They travelled in two railcars, a Bugatti and a pneumatic-tyred Michelin, and had the unintended experience of a puncture on the latter when travelling at about 80 m.p.h. The warning whistle was immediately effective in attracting the driver's attention, the car was stopped, the wheel changed, and the car re-started within 10 minutes.

Banquet and Presidential Garden Party

The garden party and reception by the President of the Republic at the Elysée on Wednesday, June 9, and the banquet in the Sports Palace at Grenelle the previous Monday night, were perhaps the most brilliant gatherings of the Congress. M. Albert Bedouce, Minister of Public Works and President of the Local Committee, was the Chairman at the latter, and at the table of honour were noted M. N. Rulot, General Manager of the Belgian National Railways and President of the International Railway Congress Association; Baron Edouard de Rothschild, Chairman of the Comité de Direction of the French Railways and also Chairman of the Congress; together with the directors of French and foreign railways.

Baron de Rothschild thanked the delegates for the close interest they had shown in the French railway industry during their visits to the various technical centres, and expressed the

* Described in THE RAILWAY GAZETTE of June 24, 1932.

* The signalling installation here was described in THE RAILWAY GAZETTE of December 8, 1933.

† This C.T.C. installation, the first in Europe, was described in THE RAILWAY GAZETTE of June 8, 1934.

* See THE RAILWAY GAZETTE *Diesel Traction Supplement* of March 22, 1935.

hope that the bonds of cordial collaboration existing between the countries represented would be drawn still closer by the opportunity afforded in the congress of renewing relations. Railwaymen, he said, had always taken the lead in the *rapprochement* of the nations for mutual aid in serving the higher interests of all countries by the revival of international traffic. From the point of view of social progress, it was again in the railway world that men were always ready to cut new trails with bold ideas and innovations, which they carried out wisely and well as pioneers of the railway's civilising influence. Continuing, he cited some of the special technical efforts made by various European countries. Great Britain, said Baron de Rothschild, had specialised in permanent way apparatus and in the development of containers; Germany had brought to perfection high-speed diesel engines for railcars; Belgium had excelled in organising repairs to rolling stock and other material; while Italy and Switzerland had been leaders in electric traction. The United States, too, he added, had made great progress in the use of automatic colour-light block working and in the remote control of signalling.

M. Rulot in a brief speech alluded to the great results achieved by railways in all countries and congratulated the delegates on the atmosphere of cordiality that had prevailed during the congress in Paris. M. Bedouce, who followed, stressed the pleasure the French Government had felt in seeing this gathering of representatives of a worldwide industry in Paris at the same time as the opening of the Paris International Exhibition, where all nations were co-operating for the growth of international friendship. After his speech, the Minister of Public Works bestowed several decorations and notably awarded M. Rulot the insignia of Commandeur de la Légion d'Honneur,

The hospitality of the French railways and the never-failing kindness of their officers has been greatly appreciated; the excursions have been on a lavish scale, as witness that arranged by special train to Le Havre to visit the French liner *Normandie*, the trips to the Chateaux de Loire, Fontainebleau, Compiègne, Versailles, and the Chantilly races.

THE BUSINESS SESSIONS

Section I.—Way and Works

Sir Ralph Wedgwood was elected president of this section which covered three questions: (I) permanent way for heavy loads and high speeds; (II) use of welding to obtain long rails and in the manufacture and repair of track fittings; and (III) maintenance of metal bridges, signals, and metal supports to carry the contact wire on electric railways. Until the arrival of Sir Ralph Wedgwood, Lord Rockley presided.

In the course of the discussion of Question I, which lasted for two mornings, Dr. Müller (German State Railway) gave information about recent experiments in Germany which showed that on a well-laid and perfectly level section of line, with 100 lb. rails, while comparatively light trains at speeds up to 125 m.p.h. had no noticeable effect on the track, very heavy goods trains run at relatively low speeds caused appreciable damage, especially to the joints.

In discussing the speeds of trains on curves, various speakers gave the formulæ adopted by their particular railways, but emphasis was laid on the vital importance of proper maintenance. M. Desaleux of the P.L.M. mentioned the satisfactory results obtained from the use of 124-lb. rail of which that company expected to have 345 miles of track in service by the end of 1937.

Mr. Wallace (L.M.S.R.) said that, although the normal sleeper spacing of 2,100 a mile was considered sufficient as a general rule for heavy loads (such as 22½ tons per axle) at 90 m.p.h., he was trying 2,600 sleepers a mile with a view to reducing maintenance costs. Referring to a question as to the relative merits of flat-bottomed and bull-headed track, he did not consider that flat-bottomed rail demanded closer sleeper spacing than bull-headed. Dr. Müller mentioned that experience with rails up to 2,000 m. in tunnels had shown the advisability, from a maintenance point of view, of limiting the length to 60 m. Mr. Ellson (S.R.) spoke of satisfactory experience with steel sleepers under high speed traffic.

Question I—Conclusions

The final summary adopted for Question I refers to the tendency to increase axle loads to 20-25 tons, and mentions the 35-ton axle load reached in North America. It refers also to the tendency to increase the former usual maximum speed of ordinary passenger trains from 75 m.p.h. to 93 m.p.h., and to as much as 100 m.p.h. for railcars. Under these conditions it recommends that the increasing dynamic effects should be fully investigated as a guide both to finding suitable ways of balancing and distributing forces, and to appreciating the stresses the track must withstand. Emphasis is laid on the necessity for the perfect alignment and level of the track to assure the safe and smooth running of high-speed trains, and the importance of good and sufficient ballast and drainage is stressed in connection with the possibility of proper maintenance. Point and crossing design should aim at long and easily curved turnouts, rigidity, and the avoidance of interruption in the running surface, and the means of guidance of the wheels.

Application of Welding

Two mornings were devoted to this question and statements were made as to the practices of the various administrations. Dr. Müller reported that the German rolling mills were now supplying rails 30 to 60 m. long for main lines, but that secondary lines were being relaid with old rails, the worn out ends of which were cut off, welded into uniform lengths of 20 m. MM. Ridet (Eastern Railway of France) and Lemaire (Belgian National Railways) both reported similar practices, and added that the old rails, after welding into 22-m. and 35-m. lengths respectively, were annealed. Mr. Cooper (L.P.T.B.) gave important evidence as to the sufficiency of ordinary normal-length joint gaps on well-maintained track for rails up to 240 ft. long. Other speakers confirmed this point. Mr. Cooper suggested that the question of adequate tests of welded joints was worthy of close study. Dr. Müller said that after systematic experiments in Germany, the Reichsbahn had fixed the maximum length of rail to be used at 60 m., despite the fact that on a test length of standard track laid with long welded rail and heated, under traffic, until deformation occurred, there was no distortion on the straight until a temperature of 180° C. (356° F.) was reached. On a 500-m. curve deformation occurred at 130° C. (266° F.). Apart from facilitating maintenance, it had been found that rail joints about 60 m. apart helped to avoid the regular oscillation, amounting to resonance, in rolling stock which tended to occur at very high speeds. As regards the welding of worn crossings, Mr. Ellson (Southern Railway) stated that this process had enabled his railway to maintain its crossings satisfactorily despite an increase in traffic intensity of 150 per cent. At present there are 18,500 crossings on the Southern maintained in this way, and the work is being continued under the ordinary traffic at the rate of 3,000-4,000 a year.

Question II—Conclusions

The summary adopted states that although welding to increase rail lengths dates back only about six years it has already given rise to improvement in track construction and savings in laying and maintenance. Not only does the process reduce the number of joints but it enables rails of different section to be welded together, so obviating the use of composite fishplates. Because the welding of joints reduces dynamic effects, savings in bridge and vehicle maintenance may be expected. Studies and experiments should be continued on the behaviour of long welded rails in running lines. The advantages of welding track components are mentioned, and the good results so far obtained are regarded as promising.

Our report of the discussion and conclusions reached on Question III will be given next week.

Section II.—Locomotives and Rolling Stock

Section III (working) joined with Section II in the discussion of Question IV, dealing with the evolution of railcars. This question is dealt with in our *Diesel Traction Supplement*. Dr.

Wechmann (German State Railway), Chairman of Section I, presided over the joint discussion, and subsequently over the discussion of Question V—"Recent improvements in steam locomotives of the usual type and tests of new designs. Testing of locomotives at experimental stations and in service with dynamometer cars and brake locomotives."

Question V.—Conclusions

The following summary of Question V, based on Sir Nigel Gresley's special report, was adopted:—

1. There has not been any marked increase in boiler pressures since 1930. A pressure of about 284 lb. per sq. in. (20 kg. per sq. cm.) can be regarded as the generally observed limit for boilers of conventional design. A total steam temperature of about 752° F. (400° C.) appears to be the maximum compatible with good lubrication, and the creep effect of the metals in contact with the steam.

2. The enlarging and improving of the live and exhaust steam pipes and passages has reduced the drop of pressure between the boiler and cylinders and has facilitated the discharge of the exhaust steam, thereby improving the steam circuit.

3. Interesting progress has been realised in the design of the exhaust, whereby the counter pressure has been reduced, combustion improved, and the thermic efficiency of the locomotive improved.

4. The scientific streamlining of locomotives appreciably reduces air resistance at high speeds and therefore increases the horse-power available for traction. Streamlined locomotives of the reciprocating type specially designed for extra high speed working have been introduced by several administrations since 1930.

5. Tests are being carried out with turbine locomotives, with a tendency to abandon condensation.

6. Testing stations are regarded as essential for the scientific study and the precise and comparative investigation of the design, performance and efficiency of locomotives and their components.

7. Trials with dynamometer cars in conjunction with brake locomotives form the best method of determining the maximum drawbar horsepower and fuel consumption of locomotives under service conditions.

8. It is desirable that all railways should agree a standard programme for the testing of locomotives, both at a testing station and under service conditions with dynamometer car and brake locomotive, so that accurate comparative results can be obtained.

Saving Electric Current

Question VI dealt with methods and devices used in connection with electric traction to save current, and again, under Dr. Wechmann's presidency, Mr. Fairburn (L.M.S.R.) read the conclusions of his special report, which were discussed and to which reference will be made in a forthcoming issue of our *Electric Traction Supplement*. Meantime it may be recorded that the most important contribution of recent years to the improvement of electric traction equipment is considered to be the mercury-vapour converter. It is predicted that in the near future the development of this equipment will reach a point when the mutator will replace the rotating converter in the same measure as the rectifier at present replaces the rotary converter for the conversion of a.c. to d.c. Emphasis is laid on the current economy of streamlining high-speed trains.

Section III.—Working

After the joint session with Section II, M. Pellerin, General Manager of the Eastern Railway of France, presided over the discussion of Question VII on the economical working of the main-line railways' secondary lines. Mr. Barrington Ward (L.N.E.R.) advocated, in preference to railcars, push-and-pull trains which had not been considered in the reports. In the summary eventually adopted this type of train, as well as railcars, is suggested in the recommendation that light trains should be used, made up for economical operation and utilisation. The importance of minimising operating expenses at the same time as trying to improve the service to the public is stressed. The advantages of up-to-date railcars is mentioned in this connection. The number of classes of passenger accommodation should be restricted, and operating methods simplified even to the extent of eliminating signals where possible. It is pointed out that some systems have found it useful to concentrate train control duties in selected stations or despatching offices. It can also be advantageous to leave station shunting movements to train crews. Simplified methods of operation, rates application and accountancy make it easier to contract out the management of unimportant stations to private individuals. Finally the conversion of small stations into unstaffed halts is considered advantageous.

Section IV.—General

Dr. Wasiutynski, Vice Chairman of the Technical Committee, Polish State Railways, was elected to the chair of Section IV, which proceeded to discuss Question X: Effects of the world crisis and road competition on the railway position, and corresponding changes in railway commercial policy. Dr. Cottier (Swiss Federal Railways), the special reporter on this question, first paid a tribute to Mr. Von Beck, his late co-reporter, who died recently. After much discussion and informative statements, among which should be mentioned Mr. Ashton Davies's explanation of the value of door-to-door facilities, and the application of commercial methods to railway administration, a summary of conclusions was adopted which began by referring to the handicap on railway financial recovery of trade restrictions, currency control, and the barriers to international trade. The summary goes on to say that it is the continual development of road competition which is the most important cause of delay in the improvement of the financial position of the railways. It is considered that road transport should be complementary to, rather than competitive with, rail transport and that the two should be co-ordinated by

(*a*) participation of railways in road transport, a participation which may, in certain cases, extend as far as concentration under one management;

(*b*) an allocation of traffics between the two methods of transport, either by mutual agreement sanctioned by the authorities, or by direct orders from the authorities;

(*c*) substituting for competitive road services combined road-rail services such as containers, transport by rail of loaded lorries or trailers, &c.

The regulation of private transport of goods is also recommended, and it is urged that, to avoid unfair competition, and to give the patrons of road hauler's security, the appropiate authorities should

(*a*) keep under strict observation all road vehicles and see that the transport by-laws are carried out, through the intermediary of the local police, with the main object of securing greater safety on the road;

(*b*) insist on all public road vehicles carrying out their responsibilities towards their clients, covering themselves against third-party risks in the same way the railways are obliged to do;

(*c*) adopt conditions of service in respect of staff employed in the public transport of both passengers and goods, comparable with those in force on the railways of the country.

The adoption of published tariffs, based as far as possible on consistent principles, by all methods of public transport is advocated to avoid the two-edged weapon of rate reduction.

The benefit of improved service, *e.g.*, higher speeds, more frequent trains, better comfort, regularity in goods delivery times and the extension of door-to-door service, is pointed out, as also is that of suitable advertising, propaganda canvassing, and close contact with clients the better to understand their wishes and needs and to keep them informed of the various advantages offered them by the railways.

Question XI.—Railway Staff

Question XI, "Selection, orientation, and instruction of railway staff" provoked a useful discussion under Professor Wasiutynski's chairmanship. The conclusions adopted mention the application by 18 railway administrations of psychotechnics as an indispensible factor of rational selection of an efficient staff. Its use tends to reduce the number of accidents due to the human element. The introduction of this science by all railways is advocated, but the methods of psychotechnical testing should be standardised. Statistics of accidents should give a more precise qualification of causes due to the human element, conjointly with the result of the psychotechnical examinations of the members of the personnel involved.

Section V.—Light Railways

Question XII, "Co-ordination of operation as between main-line and light railways," was considered jointly by Sections III and V with M. Pellerin in the chair. The summary drafted by

M. Belmonte (Italian State Railways) was adopted with a minimum of discussion and reads as follows:—

1. In all countries, co-ordination of operation of the main-line and secondary railways is recognised, in principle, as not only useful, but necessary.

2. It is generally considered as an effective means of meeting the growing competition of other methods of transport.

With regard to the *installations*:

3. In the case of two railways of the same gauge, it is preferable to have common junction stations in which the existing equipment of the main-line is used to cover the needs of the secondary railway.

4. In the case of railways of different gauges, with separate stations near one another, the narrow-gauge line should run into the main-line railway station, unless transporter trucks are used; in this case it is desirable that the connection should be a standard-gauge line.

As regards *operation*:

5. Both in joint stations and in separate stations connected together, the main-line railway should co-operate with the light railway to the maximum possible extent, in return for compensation.

6. Through (interchange) traffic should be dealt with under a combined-service system, with a single transport contract (waybill) and joint responsibility of the carriers.

7. When a combined service is impossible or inconvenient, the carriers should make agreements about correspondence services for carrying goods without intervention of the parties concerned at the junctions.

8. It is desirable that the carriers should control their own rates, and on the basis of these rates each carrier should receive the remuneration due for the services actually carried out on his line.

9. It is always better for through transport to follow the cheapest route unless this seriously interferes with prompt delivery.

10. It is not desirable in principle to enforce transit in the case of through traffic, even when the transit route is the shortest.

11. When common stock and the indiscriminate use of goods wagons are not considered advantageous, railways of the same gauge, provided safety is not affected, should make agreements for the reciprocal exchange of goods wagons, or at least for running main-line vehicles over the secondary railway.

12. In the case of narrow-gauge railways, carriage on transporter trucks or in containers may prove an adequate corrective of the difference in gauge.

13. In the case of passenger services, connecting the light railway with important centres on the main-line railway by means of trains continuing over sections of the main-line can be tried with profit.

14. As regards *competition*, conjointly with the more important means investigated by the technical services to get the best out of co-ordination, the following can be recommended:—

(*a*) The main-line railway should co-operate to the maximum extent in increasing the average speed of goods in through traffic;

(*b*) the greatest possible extension of "door to door" transport, even at all stations of both the main-line and secondary railways, and, where required, the organisation of road transport in districts not served by rail;

(*c*) whilst safeguarding the autonomous organisation of each railway, accountancy work should be simplified.

STAFF AND LABOUR MATTERS

Railway Wages

Following the joint meeting on May 28 when the representatives of the railway companies gave "a negative reply" to the three railway trade unions in respect of their programmes, the unions have been considering the position, and it now seems certain that the claims will proceed to the next stage of the Machinery of Negotiation, *i.e.*, the Railway Staff National Council. The council consists of eight representatives of the railway companies (two nominated by each of the railway companies) and eight representatives of the trade unions (four nominated by the National Union of Railwaymen, two by the Associated Society of Locomotive Engineers and Firemen, and two by the Railway Clerks' Association). Failing agreement by the National Council, the claims may be referred to the Railway Staff National Tribunal.

Holidays with Pay

In our issue of April 2 we referred to the appointment of a Government committee to consider the question of holidays with pay. On Tuesday last, June 8, evidence was given on behalf of the Trades Union Congress General Council. A memorandum of evidence had been submitted, and Sir Walter Citrine (Secretary), together with members of the council, attended before the Government committee sitting under the chairmanship of Lord Amulree.

The T.U.C. memorandum stated that, out of a total employed population of about 18 million, there were not more than 4 million who had holidays with pay; not more than 2 million of whom could be described as manual workers, and hardly any of those 2 million received a paid holiday of more than one week. It was contended that the need for holidays with pay had increased in recent years, and it was submitted that employment today, generally, was more exacting than it was ten or fifteen years ago, and much more exacting than it was twenty-five or thirty years ago.

It was stated that, while it was impossible to say, in advance, what percentage addition to the total wages bill would be made by a fortnight's holiday with pay, it would "certainly be less than 4 per cent." The T.U.C. submitted proposals providing that all employed persons should be guaranteed by law after twelve months' service of not fewer than 1,800 working hours, an annual holiday, with pay, of a minimum of twelve working days, exclusive of Bank and other public holidays.

Sir Walter Citrine, in reply to a question by the Chairman, said that the T.U.C. scheme could be administered under the principle of collective bargaining "so long as it had the force of the law behind it." In reply to a further question as to how the holiday was to be paid for, Sir Walter replied that the T.U.C. was quite opposed to a contributory system as it believed the employers should bear the cost. Questions were asked concerning particular groups of employees—casual workers, farm workers, cotton workers, and coal miners.

At the conclusion of the T.U.C. evidence, Mr. A. S. Comyns Carr, K.C., suggested a scheme on the same lines as unemployment insurance—that the cost of the holiday should be borne by the employer, the State, and the worker in equal contributions. The committee adjourned until June 15.

L.P.T.B. (Central Area) Busmen

In accordance with the provisions of the strike settlement reached on May 26, representatives of the London Passenger Transport Board and the Transport and General Workers' Union have completed the draft of a new agreement governing the working conditions of London busmen. The draft has to be submitted for approval to the board and the men before it can become operative. When confirmed it will replace the agreement which the busmen gave notice to terminate before the strike started on May 1. The next step in fulfilment of the strike settlement terms will be the setting up of joint machinery for the examination of schedules and for the investigation of the effect of the men's working conditions on their health.

It was announced on Tuesday last that the Executive Committee of the Transport and General Workers' Union had decided to hold an enquiry into the functioning of the bus section of the union during the London bus strike and, pending the result of the enquiry, the bus section will be controlled by the executive committee.

Railway and Other Reports

Rohilkund & Kumaon Railway.—The board, on June 3, declared an interim dividend for the half-year ending March 31, 1937, of 4 per cent. together with a bonus of 3 per cent., or 7 per cent. in all, on the ordinary stock. The dividend and bonus will be paid, less income tax at the rate of 2s. 8d. in the £, on July 26, 1937.

Bengal & North Western Railway.—After placing as usual £35,000 to sinking fund, the directors, on June 3, declared an interim dividend for the half-year ending March 31, 1937, of 4 per cent., together with a bonus of 4 per cent. or 8 per cent. in all, on the ordinary stock. The dividend and bonus will be paid, less income tax at the rate of 2s. 9d. in the £, on July 26, 1937.

Ribble Motor Services Limited.—A final dividend is announced of 6 per cent., making 10 per cent. for the year ended March 31 last.

Ancillary Businesses of British Railways in 1936

VI—Air Transport

It is a singular coincidence that the earliest and the latest ancillary acquisitions of the British railways are both, at the present time, financial failures. The reasons for this, however, are very different inasmuch as canals represent an old industry which has been superseded by a quicker and more reliable form of transport, whereas internal air travel is still in its infancy, and has not yet developed to an extent sufficient to make it a commercial success. It will be seen from the details set out below that last year witnessed a continuance of the financial losses which have marked the operation of the companies' air services from their inception, although there was a decreased loss in the case of the Southern Railway:—

	Gross receipts		Expenditure		Loss	
	1936	1935	1936	1935	1936	1935
	£	£	£	£	£	£
G.W.R.	2,266	2,183	10,978	9,118	8,712	6,935
L.M.S.R.	20,856	12,626	48,738	39,902	27,882	27,276
S.R.	1,543	1,196	5,891	10,184	4,348	8,988
Total	24,665	16,005	65,607	59,204	40,942	43,199

It will be seen that the total figures reveal some improvement in the position compared with 1935. Receipts increased by £8,660 (54 per cent.), expenditure rose by £6,403, and the net loss decreased by £2,257. Viewing the results individually, that of the L.M.S.R. is the most striking, since this company's increase of £8,230 (65 per cent.) in receipts involved an additional loss of only £606. Commenting upon the matter at the annual general meeting of shareholders in March last, Sir Josiah Stamp remarked, "our air services are giving a continuously higher standard of regularity and comfort, but need greater public support before they can be regarded as fully established." The Southern Railway Company's result was also very satisfactory compared with the previous year; receipts increased by £347, while expenditure decreased by £4,293, the resultant loss being £4,348, or £4,640 less than in 1935. This was due chiefly to the discontinuance of the Southampton—Isle of Wight services in conjunction with the Spartan Air Line.

The figures quoted indicate that there is a place in the transport arrangements of Great Britain for the facilities provided by the railway companies through the medium of Railway Air Services Limited. So far, however, the demand for these services has been very limited, with the result that the receipts have been insufficient to meet the relatively high cost of operating. The principal factors responsible for the small measure of public support accorded internal air services in this country are:—

(1) Comparatively short distances involved.

(2) The excellence of surface transport.

(3) Time occupied in getting to and from airports.

(4) The high fares charged in relation to other forms of transport.

The first two considerations are likely to prove permanent handicaps to the development of commercial air routes in the British Isles, but it is certainly within the bounds of possibility that the third and fourth factors may be overcome in due course. So far as the fares question is concerned, it is interesting to note that certain American air lines have introduced special winter fares which are appreciably less than those of "extra-fare" trains. So far as Great Britain is concerned, internal air services show to most advantage in those cases where they constitute a ferry service across a sea channel or estuary which ordinarily involves transfer to and from a steamship service.

Last year Railway Air Services began its summer service with a fleet augmented by the addition of two four-engined and four two-engined De Havilland machines. The programme provided for no fewer than 62 regular daily services, involving a total daily route mileage of over 14,000, and the aggregate mileage for the summer was approximately 906,000, compared with 600,000 in 1935. The main trunk service operating from Croydon to Belfast and Glasgow remained unaltered, but the introduction of faster machines on the Liverpool and Manchester to Isle of Man Royal Mail service enabled a saving of fifty minutes to be effected in the journey time between Manchester and the island. Additional services were introduced between the Isle of Man, Leeds and Bradford, and between Manchester, Liverpool, and Belfast. An extra service was also provided between Belfast and Glasgow, and new direct routes were opened from Glasgow and Carlisle to the Isle of Man. Cardiff was substituted for Birmingham as the northern terminus for the Torquay and Plymouth service, but the link with the Midlands was maintained by an air-ferry across the Bristol Channel from Cardiff to Weston-Super-Mare and Bristol where connection was made with the Manchester—Liverpool—Birmingham — Bristol — Southampton—Isle of Wight—Shoreham (for Brighton) trunk route. The Isle of Wight call in this latter service was substituted for the call made at Portsmouth in 1935. A new direct ferry service from Shoreham to the Isle of Wight was also introduced, and the usual Channel Islands services were operated in conjunction with Channel Islands Airways Limited, although the London—Guernsey service was suspended in August.

Every effort was made to popularise the services and cheap day bookings were introduced on certain days of the week between many points covered by the Manchester—Brighton and Bristol—Plymouth routes. For the convenience of passengers, arrangements were also made for the Manchester—Brighton planes to call, if required, at Stoke-on-Trent, and at the Gloucester and Cheltenham airport. A Sunday air service was inaugurated between South Wales and the South Coast, and day excursion tickets were issued.

A valuable feature of the railway air services is their co-ordination with the surface transport facilities of the railways. Passengers have placed at their disposal all the advantages of rail travel, including the benefit of the luggage-in-advance arrangement, while passages may be booked at any railway station or town office. Another valuable consideration is the interavailability of rail and air tickets; a passenger finding it inconvenient to make the return journey by air is able to use the ticket for first class boat or rail travel, while return railway tickets or bulk travel vouchers may be made available for any suitable R.A.S. service on payment of a supplement. In the case of railway season ticket holders, a discount is allowed off the air fare between points within the area of availability of their season tickets. Many of the services were discontinued in the autumn, but daily services on the London—Liverpool—Belfast—Glasgow route were continued throughout the winter, with connecting services between Liverpool and Manchester and "by request" calls at Birmingham and Stoke-on-Trent. Separate services were also maintained between Glasgow and Belfast; and between Manchester, Liverpool, Blackpool and the Isle of Man.

The railway companies undoubtedly have excellent reasons for the discontinuance of certain air services during the winter, but there is something to be said in favour of a larger proportion of all-the-year-round services. The spasmodic introduction of services, with frequent intervals of nearly eight months during which the facilities are withdrawn, seems hardly sufficient for the fostering of that public demand which alone can reduce the heavy losses at present incurred. In this connection, it is significant that the London—Liverpool—Belfast—Glasgow service, which has been in continuous operation since 1934, shows a progressive increase in passenger traffic.

Summer Train Services

In addition to the high-speed Anglo-Scottish services of the L.N.E.R. and L.M.S.R., dealt with at the beginning of this article, rearrangements of train services by both companies result in extensive accelerations

Many important improvements of service figure in the summer timetables of the L.M.S. and L.N.E. Railways, which come into force on July 5. Chief among them are the new high-speed Anglo-Scottish services. The Coronation, leaving King's Cross at 4 p.m., and for the first time providing a late afternoon service from London to Scotland, and *vice versa*, will run to York, 188·2 miles, in 157 min., at 71·9 m.p.h., and this will be the fastest scheduled start-to-stop run in the British Empire. With a connection leaving Leeds at 5.50 p.m., the Coronation will leave York at 6.40 p.m., and cover the 204·5 miles to Edinburgh non-stop in 3 hr. 20 min. (61·4 m.p.h.), arriving at 10 p.m. In the reverse direction the Coronation will leave Edinburgh at 4.30 p.m. (with a connection from Aberdeen at 12.45 p.m., giving a connection to London in 9¾ hr.), and run the 124·4 miles to Newcastle in 2 hr. (62·2 m.p.h.); leaving Newcastle at 6.33 p.m., it will cover the 268·3 miles thence to King's Cross in 3 hr. 57 min., at 67 m.p.h. The Coronation Scot of the L.M.S.R. is to have a symmetrical timing arrangement, starting from both Euston and Glasgow at 1.30 p.m., reaching both opposite terminals at 8 p.m., and allowed 283 min. for the 299·1 miles between Euston and Carlisle (63·4 m.p.h.) and 105 min. for the 102·3 miles between Carlisle and Glasgow (58·5 m.p.h.). This service will be of considerable advantage to passengers to and from Dumfries and Kilmarnock, who, in the down direction, will be able to change at Carlisle into the 11.50 a.m. from St. Pancras, so saving 1 hr. 40 min., and, in the up direction, will be able to change from the 12.10 p.m. from St. Enoch into the Coronation Scot at Carlisle, so saving 71 min. to London.

The Midday Scot

There is to be a complete rearrangement of the existing Midday Scot and associated services, which also will bring about some considerable improvements. The down Midday Scot, which will be accelerated 10 min. from Euston to Edinburgh, arriving there at 9.45 p.m., is to stop at Wigan in order to attach through coaches from Manchester to Edinburgh and Glasgow, off a new express leaving Manchester at 4.45 p.m., and at Lancaster will receive a through portion from Liverpool to Edinburgh and Glasgow; as compared with present facilities, the gains in time on the existing through evening service from Liverpool and Manchester to the Scottish cities will range in extent from 26 to 53 min., and Liverpool will be brought within 4 hr. 40 min. of Edinburgh. The Aberdeen section will be transferred from the Midday Scot to the existing 1.30 p.m. from Euston, which will start 5 min. later, and will be extended from Oxenholme to Lockerbie, keeping ahead of the Midday Scot throughout. This will necessitate some very fast intermediate timings, such as 82 min. for the 82·6 miles from Euston to Rugby, 22 min. for the 21 min. from Preston to Lancaster, and no more than 5 hr. 48 min. for the entire 299·1 miles from Euston to Carlisle, inclusive of seven intermediate stops consuming in all 24 min. Perth will be reached at 10.40 p.m.—an acceleration of 23 min. on the present arrival of the Midday Scot, and a more convenient arrival hour than the existing 11.28 p.m. In the southbound direction the 12.20 p.m. from Perth (10.5 a.m. from Aberdeen) will run in two parts, the second, at 12.30 p.m., taking up the working of the existing train and still reaching Euston at 10.40 p.m., whereas the first, at 12.20 p.m., will be attached at Law Junction to the Glasgow portion of the Midday Scot, which will leave Glasgow at 1.35 instead of 1.30 p.m. Combining at Symington with the Edinburgh section (1.40 instead of 1.30 p.m. from Princes Street), the Midday Scot will run roughly 10 min. later than its present times and reach Euston at 9.30 p.m. The 4.5 p.m. (to start at 3.51 p.m.) from Barrow will now connect at Lancaster with the Midday Scot and effect an acceleration of 56 min. from Barrow to Euston.

Faster Trains in Scotland

In Scotland 3-hr. services are to be established by the L.M.S.R. twice daily in each direction between Glasgow and Aberdeen, a distance of 150¾ miles, by some smartly-timed trains of limited formation. These leave Glasgow (Buchanan Street) at 10.5 a.m. and 1.30 p.m., and Aberdeen at 9.35 a.m. and 3.20 p.m., with restaurant car accommodation in each case; three of the trains form in effect advance portions of existing expresses. The 9.35 a.m. calls only at Forfar and Perth; the other three at Perth and Stonehaven only, the two northbound trains being booked to cover the 74½ miles from Perth to Stonehaven in 76 min. start-to-stop. New residential trains are also introduced between Glasgow and Largs, with intermediate stops at Paisley and West Kilbride only, taking 55 min. for the 42¾ miles, as compared with a previous best time of 62 min.

On the L.N.E.R. in Scotland the only improvement of any note is the 5.15 p.m. service from Edinburgh to Aberdeen, in connection with the down Flying Scotsman, which after 30 years restores a 3-hr. timing over this difficult 130½-mile route, inclusive of six intermediate stops. The Flying Scotsman itself runs non-stop between King's Cross and Edinburgh as usual, and is accelerated by a further 15 min., so bringing the time for the 392·7 miles down to 7 hr., and the average speed up to 56·1 m.p.h. The up "Junior" Scotsman, as it is popularly known, at 10.15 a.m. from Edinburgh, is accelerated to a run of 7 hr. 20 min. to King's Cross, like the down train, notwithstanding the handicap of the additional stop at Darlington, so making five stops within the compass of this overall time, and finishing with a schedule of no more than 106 min. over the 105·5 miles from Grantham to King's Cross. In England the L.M.S.R. Royal Scot is this summer to stop in Carlisle station instead of at Kingmoor, and so to be available to London—Carlisle passengers—and *vice versa*—a great improvement on the later and much slower service offered to and from Carlisle at this hour in previous summers—but the times of 7½ hr. from Euston to Glasgow and 7hr. 25 min. from Glasgow to Euston remain unaltered.

Chief among other L.M.S.R. changes is the 50-min. later start from Euston of the Ulster Express, which has the stops between Euston and Morecambe cut out, so making the non-stop run of 234 miles from London to the Lancashire coast resort in 4 hr. 12 min. The service from Euston to Crewe, Preston, and Rochdale is to be maintained by a 6.10 p.m. train running in the same times as the present service. Among minor accelerations, the Lakes Express is to arrive at Euston at 5.5 instead of 5.10 p.m., and the 2 p.m. from St. Pancras at Nottingham at 4.10 instead of 4.13 p.m.

Some exceptionally fast running for Sunday services appears in the L.N.E.R timetables, including a 7 hr. 25 min. timing from Edinburgh to King's Cross (4 hr. 55 min. from Newcastle, 3 hr. 17 min. from York, and 107 min. from Grantham), and a triplication of the 6 p.m. from King's Cross (6 p.m. to Newcastle, 6.10 p.m. to Hull, and 6.20 p.m. to Leeds), all running non-stop over the 156 miles to Doncaster in 162 min. A Saturday novelty is to be an afternoon service to Holland via Flushing, leaving Liverpool Street at 3 p.m. In the general arrangement of the L.N.E.R. timetable book there are some considerable changes, the book starting with a summary table of the main-line service between King's Cross and Scotland, with principal intermediate stations and connections, the sectional detailed tables—King's Cross to York, York to Newcastle, Newcastle to Edinburgh, Edinburgh to Aberdeen, and Aberdeen to Elgin—being all now found in their appropriate geographical positions in the book, instead of at the beginning.

NOTES AND NEWS

Ministry of Transport New Offices.—The offices of the Ministry of Transport were transferred from Whitehall Gardens, S.W.1, to Metropole Buildings, Northumberland Avenue, W.C.2, on Monday last, June 7. The telegraphic address is Transminry, Rand, London. The telephone number (Whitehall 8400) is unaltered.

New Signals at Hartlepool Docks.—The L.N.E.R. is to introduce electric colour-light signals at the Dock Head, Hartlepool, in place of the mast and ball type. The colour-light signals of two aspects, green and amber, will function day and night, but those for day use will be of considerably greater candle power than those in use at night.

D.E.U.A. Outing.—The annual outing of the Diesel Engine Users' Association took the form this year of a visit to the Crewe works of the London Midland & Scottish Railway on June 9. In addition to seeing a variety of diesel locomotives in service and under repair, the visitors had the opportunity of inspecting the new streamlined 4-6-2 engines for the Coronation Scot.

Floral Display near Northallerton, L.N.E.R.—A "Coronation" floral display composed of 6,000 tulips, portraying a crown and the letters "G.R.," with other emblems, has been a striking and topical lineside feature a little south of Northallerton station, L.N.E.R. There are 3,000 white tulips in the display, which also includes the colours red, blue, and yellow (the latter to represent the gold in the crown).

Progressive System for Wagon Repairs at Stratford.—The L.N.E.R. has decided to reorganise the system of working at its wagon repair shops at Temple Mills, Stratford, so that in future a progressive system of repairs to wagons will be carried out. The crippled wagons will enter the shops at one end and after each process has been completed will move forward until they emerge in fully repaired condition and again ready for traffic.

London Transport Bill.—The proposed extension of the Edgware tube for 2¾ miles to Elstree was opposed by the Herts County Council and the Harrow District Council, when the London Transport Bill came before a Select Committee of the House of Lords on June 8. Mr. Craig Henderson, K.C., for the promoters, explained that a similar extension was authorised in 1903, but the powers lapsed in 1911. A subsidiary company of the Underground Electric Railways Company of London Limited had acquired a considerable area of land which would be required eventually for the proposed extension. The new line was estimated to cost £815,000, and on that basis was expected to give a return of 6½ per cent. Evidence was given by Mr. Frank Pick, Vice-President of the London Passenger Transport Board. The case for the Herts County Council against the Bill was opened on June 9; the objection is that the station and depot at Aldenham would spoil a beautiful stretch of country, and that the scheme would continue the fringe development of London.

Mohaka Viaduct, New Zealand.—The Mohaka viaduct, *magnum opus* of the North Island, East Coast Railway, which was abandoned (partly constructed) for many years, has now been so far completed as to allow of the passing of the first train over it on May 31. It is claimed to be the largest viaduct in the Southern Hemisphere, and parts of it are over 300 ft. above the river bed.

Improved Hull - New Holland Ferry Facilities.—A new floating pontoon at Victoria pier, Hull, for the accommodation of the L.N.E.R. Hull-New Holland ferry steamers, was opened on June 9. The L.N.E.R. is providing corresponding improved facilities at New Holland. The new pontoons will enable motorcars to be driven direct on to the ferries, and the rates for the conveyance of this traffic have recently been reduced by the L.N.E.R.

The p.s. "Ryde" reaches Southampton.—The new Southern Railway paddle steamer *Ryde*, for the Portsmouth-Ryde service, has now been delivered to Southampton Docks from the building yard at Dumbarton of William Denny & Bros. The *Ryde*, which is to enter service on July 1, has accommodation for 1,050 passengers, and is the seventh vessel commissioned for the Portsmouth-Ryde service during the last thirteen years.

Santander - Mediterraneo Railway.—At the 32nd ordinary general meeting of the Central Mining & Investment Corp. Ltd. on May 25, reference was made by the Chairman, Mr. F. R. Phillips, M.C., to the debt due by the Spanish Government to the Santander-Mediterraneo Railway Company. In view of the continuance of the hostilities in Spain it has become apparent that negotiations for a settlement of the debt must inevitably be further postponed, and provision in the Central Mining accounts is made for the corporation's commitment in the Anglo-Spanish Construction Co. Ltd., the subsidiary undertaking responsible for the construction of the railway. Reserves had fortunately been built up in the past to meet this contingency and the loan is now written down to a nominal figure and the debentures to 5 per cent. of their nominal value. Meanwhile the claim of the Santander-Mediterraneo Company against the Spanish Government remains undisputed and will be pressed at a suitable opportunity. The Chairman added an expression of gratitude and admiration for the loyal and devoted service rendered to the Santander-Mediterraneo Company by Señor Aguinaga and Señor Cobian, with sympathy in their present anxiety, and a fervent hope that Spain will one day again enjoy peace and prosperity.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of April, 1937, amounted to $11,870,000, an increase of $1,290,000 in comparison with April, 1936. In the working expenses of $10,022,000 there was an increase of $779,000, leaving net earnings $511,000 higher, at $1,848,000. Aggregate gross earnings for the first four months of 1937 were $43,537,000, an improvement of $3,673,000 on the first four months of 1936, and the net earnings of $5,490,000 were higher by $1,325,000.

Canadian National Earnings.—For the month of April, 1937, gross earnings of the Canadian National Railways amounted to $17,056,398, an increase of $2,014,627 over April, 1936. Operating expenses ($14,807,383) advanced by $1,220,918, to leave net earnings of $2,249,015, which were $793,709 higher than for April, 1936. Aggregate gross earnings from January 1 to April 30, 1937, were $62,033,587, an improvement of $6,712,045, and the net earnings for the four months were $4,566,511, an increase of $3,034,463 over those for the corresponding period of 1936.

New 4-6-4 Locomotives for the Nord.—Our description in THE RAILWAY GAZETTE of May 14 last of the new 4-6-4 locomotives for the Northern Railway of France should have stated that the designs were those of Monsieur de Caso, Ingénieur Principal, Locomotives, O.C.E.M., who was also responsible for the designs of the highly successful 2-8-2 tank and 2-10-0 types of the Nord, described in our issues of March 17 and December 29, 1933, as well as for the ingenious system of balancing seen by delegates to the International Railway Congress on one of their visits to the Vitry locomotive testing station at Paris.

Forthcoming Meetings

June 14 (*Mon.*)—**Great Southern of Spain Railway Co. Ltd.** (Ordinary General), 2, Broad Street Place, E.C.2, at 2.30 p.m.

June 15 (*Tues.*)—**Antofagasta (Chili) & Bolivia Railway Co. Ltd.** (Ordinary General), Winchester House, Old Broad Street, E.C.2, at noon.

June 18 (*Fri.*)—**British Electric Traction Co. Ltd.** (Ordinary General), Winchester House, Old Broad Street, E.C.2, at 11.30 a.m.

Forthcoming Events

June 12 (*Sat.*).—Permanent Way Institution (Manchester–Liverpool), at Temperance Inst., London Street, Southport, 3 p.m. "Brickwork and Concrete," by Mr. J. Wolstencroft.

June 14 (*Mon.*).—Institution of Mechanical Engineers, in Leicester. Summer Meeting.

June 17-21.—Stephenson Locomotive Society. Summer Tour in Scotland.

June 26-July 11.—Institute of Transport, in Germany. Congress.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 22nd Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,874 mls.)						
Passenger-train traffic...	515,000	534,000	– 19,000	9,792,000	9,381,000	+ 411,000
Merchandise, &c. ...	510,000	396,000	+ 114,000	10,696,000	10,421,000	+ 275,000
Coal and coke ...	244,000	153,000	+ 91,000	5,983,000	5,531,000	+ 452,000
Goods-train traffic ...	754,000	549,000	+ 205,000	16,679,000	15,952,000	+ 727,000
Total receipts	1,269,000	1,083,000	+ 186,000	26,471,000	25,333,000	+1,138,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	338,000	368,000	– 30,000	6,394,000	6,130,000	+ 264,000
Merchandise, &c. ...	359,000	268,000	+ 91,000	7,421,000	7,122,000	+ 299,000
Coal and coke ...	256,000	158,000	+ 98,000	5,616,000	5,269,000	+ 347,000
Goods-train traffic ...	615,000	426,000	+ 189,000	13,037,000	12,391,000	+ 646,000
Total receipts	953,000	794,000	+ 159,000	19,431,000	18,521,000	+ 910,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	218,000	216,000	+ 2,000	4,075,000	3,932,000	+ 143,000
Merchandise, &c. ...	214,000	158,000	+ 56,000	4,300,000	4,143,000	+ 157,000
Coal and coke ...	114,000	56,000	+ 58,000	2,486,000	2,255,000	+ 231,000
Goods-train traffic ...	328,000	214,000	+ 114,000	6,786,000	6,398,000	+ 388,000
Total receipts	546,000	430,000	+ 116,000	10,861,000	10,330,000	+ 531,000
S.R. (2,153 mls.)						
Passenger-train traffic...	345,000	324,000	+ 21,000	6,309,000	5,941,000	+ 368,000
Merchandise, &c. ...	63,500	46,500	+ 17,000	1,306,500	1,362,000	– 55,500
Coal and coke ...	28,500	13,500	+ 15,000	699,500	707,000	– 7,500
Goods-train traffic ...	92,000	60,000	+ 32,000	2,006,000	2,069,000	– 63,000
Total receipts	437,000	384,000	+ 53,000	8,315,000	8,010,000	+ 305,000
Liverpool Overhead ... (6½ mls.)	1,272	1,387	– 115	26,552	24,808	+ 1,744
Mersey (4½ mls.) ...	4,233	4,269	– 36	93,008	89,560	+ 3,448
*London Passenger Transport Board ...	584,500	591,600	– 7,100	27,022,400	26,775,700	+ 246,700
IRELAND.						
†Belfast & C.D. pass. (80 mls.)	2,441	2,688	– 247	43,265	43,843	– 578
,, ,, goods	506	475	+ 31	11,091	12,491	– 1,400
,, ,, total	2,947	3,163	– 216	54,356	56,334	– 1,978
Great Northern pass. (543 mls.)	10,700	11,800	– 1,100	192,450	191,100	+ 1,350
,, ,, goods	9,850	8,650	+ 1,200	208,450	225,300	– 16,850
,, ,, total	20,550	20,450	+ 100	400,900	416,400	– 15,500
Great Southern pass. (2,075 mls.)	34,193	41,544	– 7,351	650,169	659,092	– 8,923
,, ,, goods	42,794	36,339	+ 6,455	913,962	930,661	– 16,699
,, ,, total	76,987	77,883	– 896	1,564,131	1,589,753	– 25,622

* 49th week (before pooling). † 23rd week

Hunt's Bank Athletic Festival

The L.M.S.R. Hunt's Bank Annual Athletic Festival was held on the Blackpool Football Club's ground at Bloomfield Road on Saturday afternoon last, June 5. This was the twenty-sixth meeting, and for the past twelve years the event has taken place at Blackpool. Between ten and twelve thousand members of the staff, relatives and friends arrived in the town in fourteen special trains, chiefly from the Manchester district.

Among the guests were the Deputy Mayor, and the Mayoress of Blackpool. Many prominent officials of the L.M.S.R. were present, including Mr. T. W. Royle, Chief Assistant Commercial Manager, a vice-president of the festival, and Mrs. Royle; and Mr. F. H. Cowell, District Passenger Manager, Manchester, Chairman of the Festival Committee.

A splendid afternoon's sport was provided by the three hundred competitors. The programme included 29 events, the majority of which were flat races. The arrangements were perfect—no hitch or delay of any kind occurred and every event finished to time. The principal trophies were won as follow:—

"Carr" Challenge Cup—220 yd. flat race, handicap: Department of the Divisional Superintendent of Operation (G. N. Flitcroft).

"Sir George Pilkington" Cup—men's relay race: Department of the Divisional Superintendent of Operation (No. 1 team).

"Sir George Pilkington" Cup—ladies' relay race: District Engineer's Department.

"Sir Josiah Stamp" Cup—inter-departmental: Department of the Divisional Superintendent of Operation.

The prizes and trophies were distributed at the close by Mrs. Royle, who was introduced to the assembly by Mr. Cowell, and presented with a bouquet by little Miss Nancy Richardson. Mr. S. W. Spendlove, a vice-president, proposed a vote of thanks to Mrs. Royle and expressed pleasure at seeing Mr. Royle present. The latter responded suitably. Mr. G. Sanderson was the Organising Secretary. During the sports musical selections were played by the Horwich R.M.I. Band.

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices June 9, 1937	Rise/Fall
G.W.R.				
Cons. Ord. ...	64¼	45½	61¼	–¼
5% Con. Prefce. ...	126½	116¾	120½	–1
5% Red. Pref. (1950)	113	108½	111½	—
4% Deb.	119½	110½	109½	–1
4½% Deb.... ...	121	114	113	—
4½% Deb.... ...	129	121	119½	—
5% Deb.	141	134	130½	—
2½% Deb.... ...	79⅛	74	70½	—
5% Rt. Charge ...	136½	130	129½	—
5% Cons. Guar. ...	135¼	127¾	127½	—
L.M.S.R.				
Ord.	35⅝	17	33¾	+½
4% Prefce. (1923)	83	52½	77	—
4% Prefce. ...	92¾	81	87	—
5% Red. Pref. (1955)	109¼	103¼	104*	–2½
4% Deb.	111¾	105 9/16	104½*	–2½
5% Red. Deb. (1952)	119⅝	115½	112½	—
4% Guar. ...	106¾	101⅝	101½	–1
L.N.E.R.				
5% Pref. Ord. ...	14	9	10¼	–¼
Def. Ord.	7¼	4¾	5	–¼
4% First Prefce.	79¼	55¼	71	–1⅛
4% Second Prefce.	31⅞	18¼	25½	—
5% Red. Pref. (1955)	100½	77¾	96	—
4% First Guar. ...	104½	98¾	100½	—
4% Second Guar.	99	90	93	—
3% Deb.	85¾	79	79½*	–2½
4% Deb.	109¾	104½	103½	–2½
5% Red. Deb. (1947)	116¼	110½	109½	—
4½% Sinking Fund Red. Deb.	111½	107½	107*	–1½
SOUTHERN				
Pref. Ord.... ...	98¾	82½	92	—
Def. Ord.	27⅝	20⅛	22¾	—
5% Pref.	120¾	118½	119½	—
5% Red. Pref. (1964)	119¾	115¼	115½	—
5% Guar. Prefce.	136	129½	128	—
5% Red. Guar. Pref. (1957)	120	115¾	115½	—
4% Deb.	117 9/16	109½	107*	–2½
5% Deb.	140	134	127½*	–1
4% Red. Deb. 1962–67	116½	110	108½*	–2
BELFAST & C.D.				
Ord.	9	4½	4	—
FORTH BRIDGE				
4% Deb.	107	105	102½	—
4% Guar. ...	107 3/16	104	102½	—
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	8	—
G. SOUTHERN (IRELAND)				
Ord.	63	41	42	—
Prefce.	65	46	48½	–3½
Guar.	97¼	81	73½	–1½
Deb.	99¾	83¼	92½	—
L.P.T.B.				
4½% "A" ...	127¾	121	116½	—
5% "A"	138¼	133½	126½	+1
4½% "T.F.A." ...	111½	108⅛	106	—
5% "B"... ...	131¾	123¾	117½	—
"C"	112½	93	83	–3
MERSEY				
Ord.	40¾	23	28½	–1
4% Perp. Deb. ...	103	98	99	—
3% Perp. Deb. ...	78	74⅝	75½	—
3% Perp. Prefce.	68⅞	63¼	64½	+1

* ex dividend

CONTRACTS AND TENDERS

L.P.T.B. Tube Rolling Stock Motors

The London Passenger Transport Board has placed further substantial orders in connection with the provision of new rolling stock for extensions of the board's tube railway system. These orders cover the supply of a total of sixteen hundred traction motors for the new tube motor coaches and have been placed with the General Electric Co. Ltd., of Magnet House, Kingsway, W.C.2, and with Crompton Parkinson Limited, of Bush House, Aldwych, W.C.2, each of whom will manufacture 800 motors. The combined value of the orders is over £600,000, constituting, it is believed, the largest single volume of traction motor business ever placed in this country. The design of these new motors was evolved jointly by the two companies in question, who have made arrangements to ensure that similar and interchangeable machines are supplied by both firms. The whole design is to the approval of the Chief Mechanical Engineer (Railways) of London Transport. As compared with previous equipments supplied for the tube trains of the L.P.T.B., the new type of motor enables substantial improvements to be made in train acceleration, speed performance and passenger capacity. In existing types of rolling stock the space above the traction motors is not available for passenger accommodation, the floor being at a higher level there than throughout the rest of the train. The new design of motor provides increased motor capacity and at the same time permits of a sufficiently low car floor above the motors to allow for passenger accommodation. With the new motor equipments substantial improvement is possible in the rate of acceleration, and by the design of the motor for an extensive range of field control particularly flexible speed characteristics are obtained.

Greaves Cotton & Co. Ltd. has received an order from the Indian Stores Department for two motor-driven pumping sets.

The Royal Hungarian State Iron, Steel & Machine Works has received orders from the Egyptian State Railways Administration for a quantity of engine and tender tyres. (Ref. No. E.S.R. 21.624, total price approximately £422, delivery f.o.b. Trieste.)

The Crown Agents for the Colonies have recently placed orders for material and equipment as follow:—

Ferguson, Pailin Limited, Switchgear for power station.
General Electric Co. Ltd., Telephone apparatus.
Ericsson Telephones Limited, Telephone switchboards.
The Horsehay Co. Ltd., Trough decking for bridge.
Manganese Bronze & Brass Co. Ltd., White metal.
Hoyt Metal Co. of Great Britain Ltd., White metal.
Strathclyde Paint Company, White zinc.

The English Electric Co. Ltd. has received an order for two 450 b.h.p. 1-Do-1 type diesel-electric locomotives for service on the metre-gauge lines of the Eastern Railways of Brazil.

Hurst, Nelson & Co. Ltd. has received orders from the Crown Agents for the Colonies for 40 bogie hopper ballast wagons, required for the Iraq Railways.

Hurst, Nelson & Co. Ltd. has also received an order from the Crown Agents for the Colonies for five bogie tank wagons required for the Gold Coast Government Railway.

The Metropolitan-Cammell Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for four bogie brake-third coaches and three bogie mail-brake coaches, required for the Gold Coast Government Railway.

R. Wright & Partners Limited has received orders from the Indian Stores Department for 1,200 volute springs and 1,000 draw and buffer springs.

The South Indian Railway Administration has placed the following orders to the inspection of Messrs. Robert White & Partners:—

Thomas A. Edison Limited, 456 alkaline cells for train lighting.
John Walsh & Co. Ltd., 10 tons of class D steel bars.
George Turton Platt & Co. Ltd., 112 buffer plungers and spindles.
Les Ateliers Mecanique, 100 laminated bearing springs for wagons.
The Gloucester Railway Carriage & Wagon Co. Ltd., 1,800 cast iron brake blocks for electric coaches.

The Bengal-Nagpur Railway Administration has placed the following orders:

Howell & Co. Ltd., 200 superheater flue tubes.
Thomas Firth & John Brown Limited, 16 straight steel axles.
Steel, Peech & Tozer Limited, 108 locomotive and tender steel tyres.
Incandescent Heat Co. Ltd., Equipment for heat treatment shop at Khargpur.

The Bombay, Baroda & Central India Railway Administration has placed orders to the inspection of Messrs. Rendel, Palmer & Tritton, with Banting & Tresilian Limited for 26 copper firebox plates, and with Hugh Gordon & Co. for 15 copper firebox plates.

The High Commissioner for New Zealand, on behalf of the New Zealand Government Railways Administration, has placed orders with the Barrow Hematite Steel Co. Ltd. for 5,548 tons of 85-lb. B.S. rails to a total value of approximately £54,093, and with Guest, Keen, Baldwins Iron & Steel Co. Ltd., for 11,133 tons of 70-lb. B.S. rails and 4,415½ tons of 85-lb. B.S. rails to a total value of approximately £54,098. An order has also been placed with J. Stone & Co. Ltd. for electrical equipment required for railcars to a total value of £3,000.

Steel, Peech & Tozer Limited has received an order from the Burma Railway Administration, to the inspection of Messrs. Rendel, Palmer & Tritton, for 64 steel tyres.

J. W. Roberts Limited has received an order for 52 sets of asbestos mattresses for locomotives from the Great Western of Brazil Railway.

Guest, Keen, Williams Limited has received an order from the Indian Stores Department for 314,000 mild steel round spikes, and 120,000 two-way keys.

Contracts have been placed by the Finnish State Railways for 57,000 tons of British coal, principally from Durham and Yorkshire. Orders for 11,000 tons were placed in Germany. Purchases by the State Railways this year to date amount to 190,000 tons of British and 38,000 tons of German coal.

Whitelegg & Rogers Limited announces that Nicholson thermic syphons are to be fitted to the fireboxes of sixteen G.M. class Beyer-Garratt locomotives at present under construction by Beyer, Peacock & Co. Ltd., for the South African Railways & Harbours Administration. Also, three of the 4-4-0 type passenger locomotives now under construction by the North British Locomotive Co. Ltd. for the Egyptian State Railways will be similarly equipped.

Details of the construction and purchase of 4,088 freight cars, involving the expenditure of about 14,000,000 dollars (£2,800,000) have been announced by the Union Pacific Railroad, learns Reuters Trade Service from New York. New box cars numbering 2,088 will be built at the Omaha and Portland workshops of the Union Pacific and 700 automobile cars at the Grand Island shops, the work providing employment for several hundred additional men. A thousand ballast and coal wagons will be built by the American Car and Foundry Company and 200 tank cars by the General American Transport Corporation. The remaining 100 special box cars will either be constructed under contract or made at the Union Pacific's workshops. All the wagons are scheduled for completion as soon as possible this year in order to cope with the expanding trans-continental freight traffic. Building in the company's workshops will begin as soon as the necessary materials can be obtained.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Electrical Section), Simla, receivable by June 28, for the supply of seven vertical boilers required for the East Indian Railway.

Tenders are invited by the Mysore Government Stores Purchase Committee through Messrs. Rendel, Palmer & Tritton, 55, Broadway, Westminster, S.W.1, receivable by July 27, for the supply of locomotive, carriage and wagon spare parts required for the Mysore Railways during the year 1937–38.

The Chief Controller of Stores, Indian Stores Department (Miscellaneous Section) invites tenders receivable by July 1 for the supply of tool, cast and spring steels required for the G.I.P. and E.I. Railways, during the period October 1, 1937—September 30, 1938

LEGAL AND OFFICIAL NOTICES

In the Court of the Railway Rates Tribunal.

Road and Rail Traffic Act, 1933.

Agreed Charges.

NOTICE IS HEREBY GIVEN that Applications for the approval of Agreed Charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, short particulars of which are set out in the Schedule hereto, have been lodged with the Railway Rates Tribunal.

The Procedure to be followed in regard to the inspection of the said Applications and the filing of Notices of Objections in that published in the "London Gazette" of 28th July, 1936.

Printed copies of the Procedure can be obtained from the Railway Rates Tribunal, Bush House, Aldwych, London, W.C.2.

Notices of Objection to any of the said Applications must be filed on or before the 29th June, 1937.

A copy of each Application can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s. post free.

T. J. D. ATKINSON,
Registrar.

4th June, 1937.

Number of Application	Name of Trader and General Description of Traffic
1937—No. 304	ABIEISAN MANUFACTURING CO. LTD., Concordia Works, Managers Street, London, E.14; Perfumery and Toilet Requisites, etc.
1937—No. 305	H. BANCKS LIMITED, Travel Works, Westbury Road, High Street, Walthamstow, London, E.17; Fibreboard Cases.
1937—No. 306	BENNETT BROS. (HOSIERY MFTRS. & DYERS) LTD., Southfield Road, Hinckley; Hosiery.
1937—No. 307	JOHN CARWARDINE & SON (BRANCH OF STANDARD CANDLE CO. LTD.), Soap, Candle & Oil Works, Bedminster, Bristol, 3; Candles, Soap, etc.
1937—No. 308	GOSPO LIMITED, 33, Waterloo Road, London, S.E.1; Soap and Cleansing Materials, etc.
1937—No. 309	GROSS SHERWOOD & HEALD LIMITED, Jenkins Lane, Barking, Essex; Paints, Varnishes, Enamels, etc., Tinware, Painters' Sundries, etc.
1937—No. 310	KITCHENDOM LIMITED, Stadium Works, Wembley, Mddx.; Kitchen Cabinets and Components, Wardrobe cupboards, Beds and Bedding, Refrigerators.
1937—No. 311	LINTAFELT LIMITED, Resiliency Works, Loudwater, Bucks; "Lintafelt," "Resilinta," Spring Interiors, etc.
1937—No. 312	MONSANTO CHEMICALS LIMITED, Victoria Station House, Victoria Street, London, S.W.1.; Disinfecting Fluid.
1937—No. 313	MURPHY RADIO LIMITED, Broadwater Road, Welwyn Garden City, Herts; Wireless Receivers, Component Parts, etc.
1937—No. 314	MURRAY & RAMSDEN LIMITED, Carrington Field Street, Stockport; Indiarubber balls.
1937—No. 315	ST. ANDREW MILLS LIMITED, 34, St. Andrew Road, Walthamstow, London, E.17; Toilet Paper, Paper Handkerchiefs and Towels, Drinking Straws, etc. *(Applicable also to traffic consigned by one Associated or Subsidiary Company.)*
1937—No. 316	THE SOUTHERN OIL CO. LTD., Westinghouse Road, Trafford Park, Manchester, 17; Lard and Lard Substitutes.
1937—No. 317	STERLING MANUFACTURING COMPANY, Davis Street and Manchester Road, Cubitt Town, London, E.14; Mangles and Wringers, Wood Tables with Wringers, Garden Rollers, Refrigerator Porcelain Cases and Linings, Gas and Electric Stoves, Water Heater parts, etc.
1937—No. 318	TAN SAD ALLWIN CORPORATION LIMITED, Great Bridge, Tipton, Staffs; Perambulators, Invalid Chairs, Toy Cycles, Toys, Nursery Furniture, Wooden Ladders, etc.
1937—No. 319	VITAMINS LIMITED, 23, Upper Mall, Hammersmith, London, W.6; "Bemax" and Chocolate.
1937—No. 320	AVANA CAKES LIMITED, Cardiff; Slab Cake and Sponge Cake.
1937—No. 321	E. K. COLE LIMITED, Ecko Works, Southend-on-Sea; Wireless Receivers and Apparatus, Bakelite Mouldings, Wooden and Chromium Plated Stands, etc.
1937—No. 322	WILLIAM GOODACRE & SONS LTD., Ceylon Mills, Russell Road, Victoria Docks, London, E.16; Carpeting, Rugs, etc.
1937—No. 323	J. G. GRAVES LIMITED, Sheffield; Furniture, General Stores Wares, etc.
1937—No. 324	THE KIDMAR HOSIERY COMPANY, 388, Swanston Street, Bridgeton, Glasgow; Hosiery, etc.
1937—No. 325	F. C. LOWE & SON LTD., "Carta Carna" Works, Sittingbourne; Dog Biscuits, and Foods for Livestock or Poultry.
1937—No. 326	MELTONIAN (E. BROWN & SON) LIMITED, Meltonian Works, Oxgate Lane, Cricklewood, N.W.2; Polishes, Dyes, Stains, Dressings, Rubber Brushes, Tinplate Scrap, etc.
1937—No. 327	MONSOON COCOA MATTING CO. LTD., Clydesdale House, 27, Turner Street, Manchester, 4; Mats and Matting.
1937—No. 328	SMITH HAYDEN & CO. LTD., Cambrian Works, Croydon Road, Beckenham, Kent; Confectionery, etc.
1937—No. 329	TOWLES (1928) LIMITED, Loughborough; Hosiery.
1937—No. 330	H. H. & S. BUDGETT & CO. LTD., Nelson Street, Bristol; Groceries, Provisions, Confectionery, Wines, Electrical Stores, etc.
1937—No. 331	GARDNER, TITLEY & WIDGERY LIMITED, 14/16, Queen Square, Bristol, 1; Groceries, Preserves and Provisions, Confectionery, etc.
1937—No. 332	DEAN & THOMPSON LIMITED, Wellcroft Mills, Shipley, Ladies' Gowns.
1937—No. 333	DRING'S LIMITED, 8 to 14, King Street, West Smithfield, London, E.C.1; Cooked Meats, Meat Pies and Sausages.
1937—No. 334	A. G. GOLDSWORTHY & CO. LTD., I'Anson House, Darlington; Hosiery, Scarves and Underwear.
1937—No. 335	WAYNE TANK & PUMP CO. LTD., Wayne Works, Newlands Park, London, S.E.26; Petrol Pumps, etc.
1937—No. 336	BROWN, MUFF & CO. LTD., Bradford; Clothing, Drapery and General Stores Wares.
1937—No. 337	CAMPBELLS AND STEWART & MCDONALD LIMITED, 137, Ingram Street, Glasgow; Clothing, Drapery and Millinery.
1937—No. 338	J. G. GRAVES LIMITED, Sheffield; Clothing, Drapery and General Stores Wares.
1937—No. 339	HARRIS & CO. (CONFECTIONERS) LTD., Bryanston House, Lomond Grove, London, S.E.5; Biscuits, Cake, Dried Fruits, Margarine, etc.
1937—No. 340	R. & J. HILL LIMITED, Spinet House, 175, Shoreditch, London, E.1; Cigarettes and Tobacco.
1937—No. 341	KELLETT, WOODMAN & CO. LTD., 44, Union Street, Bradford, Yorks; Textiles.
1937—No. 342	THE KIDMAR HOSIERY COMPANY, 388, Swanston Street, Bridgeton, Glasgow; Hosiery and Knitted Woollen Goods.
1937—No. 343	J. PULLAR & SONS LTD., Perth; Dyed and Cleaned Goods, Goods for Dyeing and Cleaning. *(Applicable also to traffic consigned by one Associated or Subsidiary Company.)*
1937—No. 344	H. SAMUEL LIMITED, Hunters Road Works, Hockley, Birmingham, 19; Chinaware, Clocks and Watches, Cutlery, Electro Plate, Fancy Goods, Glassware, Gold and Silverware, Jewellery, Musical Instruments, Umbrellas, etc.
1937—No. 345	I. E. TRENT & CO. LTD., 10, Oat Lane, Wood Street, London, E.C.2; Textiles.
1937—No. 346	VALENTINE & SONS LTD., Westfield Works, Dundee; Calendars, Pictures, Christmas Cards, and Stationery.
1937—No. 347	W. WILLIAMS & SON (BREAD STREET) LTD., 53-54, Bread Street, London, E.C.4; Haberdashery, Knitted Sports Wear, Ladies' Handbags and Trimmings, etc.
1937—No. 348	KRAFT PRODUCTIONS LIMITED, Kraft Works, Cornboro' Place, Bridgwater, Somerset; Woven Fabric Furniture and Wickerwork.
1937—No. 349	COLLINS BROS., Mill Street, Evesham; Cooked Meat, Bacon, Meat Pies, Sausages, Ice.
1937—No. 350	EMPIRE STORES LIMITED, Canal Road, Bradford; Clothing, Drapery and General Stores Wares.
1937—No. 351	WILLIAM HOLLINS & CO. LTD., Viyella House, Nottingham; Garments, Hosiery, etc.

Transport Tour of the U.S.S.R.

UNDER the leadership of Mr. Brian Reed, a tour for the study of all forms of transport in the U.S.S.R. will be undertaken from July 17 to August 8. Visits to Leningrad, Moscow, and Kharkov (the Russian "Crewe"). Price £26 10s. to £37 10s. according to class. Particulars from Society for Cultural Relations with the U.S.S.R., 98, Gower Street, London, W.C.1.

REQUIRED, experienced Railway Signalling and Telegraphs Assistant for railways in Rhodesia. Age about 35. Candidates must have knowledge of the construction and maintenance of the following: telegraph and telephone lines; railway telegraph, telephone and phonopore instruments, including selector telephone system and automatic telephones; railway staff, tablet or key token instruments; railway signalling and interlocking. Candidates must be competent to supervise installation and maintenance of foregoing, to design layouts for stations and to prepare estimates of costs and bills of quantities for improvements, renewals and proposed new works. Three years' agreement. Commencing salary £600 per annum with annual increments of £25. Apply in writing, stating age, education, professional qualifications, full particulars of experience, married or single, and position now held, to Box 300, LEATHWAIT & SIMMONS, 1-4, Copthall Chambers, E.C.2.

Bengal-Nagpur Railway Co. Ltd.

THE Directors are prepared to receive Tenders for:—
1,950 STEEL PLANISHED PANEL PLATES.

Specification and Form of Tender can be obtained at the Company's Offices, 132, Gresham House, Old Broad Street, London, E.C.2, on or after Monday, 7th June, 1937.

A fee of 10s. will be charged for each copy of the Specification, which is *NOT* returnable.

Tenders must be submitted not later than Noon on Tuesday, 22nd June, 1937.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
T. R. WYNNE,
Managing Director.

DRAUGHTSMEN, Senior and Detail men required for aircraft constructional work. Apply stating full particulars to: EXPERIMENTAL AIRCRAFT DRAWING OFFICE, THE BRISTOL AEROPLANE CO., LTD., Filton House, Bristol.

CIVIL ENGINEERING DRAUGHTSMAN, young and single, required for Chilian Railway. Preference given to one with experience Structural Steel Work and Concrete Design. Three years' contract. Starting salary £300 p.a., with free single quarters. Free passages provided. Apply with full particulars education, training, experience, age, and copies only of testimonials, to Box "X.Y.Z.," c/o 95, Bishopsgate, London, E.C.2.

South Indian Railway Company, Limited.

THE Directors are prepared to receive Tenders for the supply of:—
LAMINATED SPRINGS.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited," marked "Tender for Laminated Springs," with the name of the firm tendering, must be left with the undersigned not later than 12 Noon, Friday, the 2nd July, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 10s. for each copy of the Specification.

Copies of the drawings may be obtained at the Offices of the Company's Consulting Engineers, MESSRS. ROBERT WHITE & PARTNERS, 3, Victoria Street, Westminster, S.W.1.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
9th June, 1937.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to:—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

Railway Share Market

Despite less uncertainty as to the future of gold and currency problems, the stock and share markets have been dull and little improvement in the volume of business was reported. Although prior charge stocks were inclined to make rather lower prices in sympathy with British Government securities, Home Railway junior stocks were in demand, largely owing to the excellent traffic figures for the past week and continued anticipations that the half-yearly statements, which are to be made towards the end of next month, will show satisfactory improvement in net receipts. The aggregate increase of £514,000 in the past week's traffics was in excess of expectations, particularly as comparison is with Whitsun Monday week of last year.

L.M.S.R. ordinary was the most active feature and business was recorded up to 34, the traffic gain of £186,000 being regarded as a very good achievement. The 4 per cent. preference and 1923 preference were little changed. Great Western ordinary was bought on the traffic gain of £116,000 and was in demand around 61¼, while there was a rally in L.N.E.R. second preference, which had reacted earlier in the week, the increase of £159,000 in the traffic return bringing in buyers. Southern deferred and preferred were firmer on the traffics, the gain in this case being £53,000. The market is talking confidently of an increase in dividend on L.M.S. ordinary and also of reasonable possibilities of higher payments for 1937 on Southern deferred and Great Western ordinary, granted the new profits tax does not apply to the railways. As regards the L.N.E.R. second preference, views as to the prospects of a larger payment still vary a good deal, and, as in the case of the other railways, it is realised it should be possible to form a more decided opinion after the half-yearly statements have been issued. It is expected the Southern interim statement will appear on July 22, the North Eastern on July 23, the L.M.S. on July 29, and the Great Western on July 30. London Transport "C" has been reactionary, business having taken place around 83.

Foreign railway stocks were dull and made lower prices in the absence of demand. Argentine stocks were inclined to be affected by the possibility that, despite the favourable traffic figures, it may be decided to follow a rather more conservative policy than has been expected in some quarters. Current market views are now a good deal less hopeful of a fractional dividend on B.A. Gt. Southern and B.A. Western ordinary stocks.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: June 9, 1937	Prices: Yield (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	834	6.6.37	14,500	+ 1,190	23	382,330	308,830	+ 73,500	Ord. Stk.	25	15¼	19	Nil
	Argentine North Eastern	753	5.6.37	11,514	+ 1,485	49	432,362	391,980	+ 40,382	"	12	2	10½	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	85§	411/16
	Bolivar	174	May, 1937	6,100	— 1,800	22	29,300	34,800	— 5,500	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	15½	3½
	Buenos Ayres & Pacific	2,806	5.6.37	110,484	+ 26,818	49	4,715,552	4,173,835	+ 541,717	Ord. Stk.	17½	6	12	Nil
	Buenos Ayres Central	190	24.5.37	$136,300	+ $37,200	47	$6,609,100	$5,035,860	+ $1,573,240	Mt. Deb.	31½	11	32½	Nil
	Buenos Ayres Gt. Southern	5,084	5.6.37	128,040	+ 7,476	49	7,306,346	6,353,211	+ 953,135	Ord. Stk.	31¾	13¾	28	Nil
	Buenos Ayres Western	1,930	5.6.37	47,395	+ 7,736	49	2,452,436	2,224,115	+ 228,321	"	29¾	11	23½	Nil
	Central Argentine	3,700	5.6.37	159,327	+ 49,671	49	7,521,373	5,756,574	+ 1,764,799	"	32932	8¾	27½	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	11½	Nil
	Cent. Uruguay of M. Video	273	29.5.37	12,757	+ 2,624	48	599,462	533,422	+ 66,040	Ord. Stk.	7¾	3	5	Nil
	Do. Eastern Extn.	311	29.5.37	3,625	+ 1,061	48	120,960	100,456	+ 20,504	—	—	—	—	—
	Do. Northern Extn.	185	29.5.37	2,443	+ 632	48	86,042	71,363	+ 14,679	—	—	—	—	—
	Do. Western Extn.	211	29.5.37	658	— 190	48	46,894	42,215	+ 4,679	—	—	—	—	—
	Cordoba Central	1,218	5.6.37	35,480	+ 3,110	49	1,568,350	1,363,890	+ 204,460	Ord. Inc.	5	1	5	Nil
	Costa Rica	188	Mar., 1937	29,517	+ 9,007	39	171,651	127,429	+ 44,222	Stk.	36½	32	36	59/16
	Dorado	70	Apr., 1937	14,400	+ 800	17	62,400	52,100	+ 10,300	1 Mt. Db.	107	101½	104½	5¾
	Entre Rios	810	5.6.37	15,422	+ 3,307	49	630,475	526,973	+ 103,502	Ord. Stk.	17	6	13	Nil
	Great Western of Brazil	1,082	5.6.37	6,500	+ 800	23	172,100	189,400	— 17,300	Ord. Sh.	½	5/16	½	Nil
	International of Cl. Amer.	794	Apr., 1937	$563,617	+ $46,024	17	$2,195,243	$2,080,641	+ $114,602	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	½	-/6	½	Nil
	La Guaira & Caracas	22¼	May, 1937	5,255	— 250	22	28,335	22,880	+ 5,455	Stk.	9	3	7½	Nil
	Leopoldina	1,918	5.6.37	25,520	+ 8,521	23	501,240	381,275	+ 119,965	Ord. Stk.	10½	3½	6	Nil
	Mexican	483	31.5.37	$464,500	+ $64,700	21	$6,795,800	$5,737,300	+ $1,058,500	"	1¼	¼	3/4	Nil
	Midland of Uruguay	319	Apr., 1937	8,764	+ 1,152	43	87,446	72,500	+ 14,946	"	1½	1/2	½	Nil
	Nitrate	384	31.5.37	3,730	+ 25	22	74,705	61,734	+ 12,971	Ord. Sh.	63/6	41/9	2½	Nil
	Paraguay Central	274	29.5.37	$1,134,000	+ $895,000	48	$143,057,000	$114,437,000	+ $28,620,000	Pr. Li. Stk.	85	71	82½	7¼
	Peruvian Corporation	1,059	May, 1937	80,256	+ 510	48	908,145	866,369	+ 41,776	Pref.	15	9	11¾	Nil
	Salvador	100	29.5.37	¢19,200	+ ¢2,000	48	¢1,162,458	¢937,646	+ ¢224,812	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153½	30.5.37	38,667	+ 1,976	22	689,645	625,674	+ 63,971	Ord. Stk.	86	46½	90½	5½
	Taltal	164	May, 1937	3,310	+ 300	48	37,920	38,505	— 585	Ord. Sh.	115/32	14/-	1⅛	87/8
	United of Havana	1,353	5.6.37	17,082	— 3,915	49	1,332,235	1,172,224	+ 160,011	Ord. Stk.	3¼	1	3	Nil
	Uruguay Northern	73	Apr., 1937	843	— 44	43	10,100	8,327	+ 1,773	Deb. Stk.	5	3	9	Nil
Canada.	Canadian National	23,782	31.5.37	1,043,613	+ 64,850	22	15,780,882	14,144,332	+ 1,636,550	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	69§	51/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	98½	4¼6
	Canadian Pacific	17,228	31.5.37	752,600	+ 76,600	22	11,074,200	10,217,400	+ 856,800	Ord. Stk.	16¾	10¼6	13½	Nil
India, &c.	Assam Bengal	1,329	20.5.37	34,132	— 674	7	178,567	170,417	+ 8,150	Ord. Stk.	87¾	82¼	75½	4
	Barsi Light	202	10.5.37	2,925	— 442	6	16,267	15,022	+ 1,245	Ord. Sh.	77½	65½	47	105/8
	Bengal & North Western	2,111	20.5.37	94,354	+ 4,510	7	460,885	445,850	+ 15,035	Ord. Stk.	319	292⅝	304	515/16
	Bengal Dooars & Extension	161	20.5.37	3,094	— 264	7	15,972	16,104	— 132	"	127½	118	100½	5½
	Bengal-Nagpur	3,268	20.5.37	191,175	+ 8,241	7	1,021,275	935,698	+ 85,577	"	104	100¼	90⅛§	47/8
	Bombay, Baroda & Cl. India	3,072	31.5.37	301,425	+ 32,475	9	1,727,675	1,634,325	+ 88,350	"	114	110½	112½	55/16
	Madras & Southern Mahratta	3,229	20.5.37	168,000	— 5,494	7	841,050	857,499	— 16,449	"	116½	108½	107½	7 7/16
	Rohilkund & Kumaon	572	20.5.37	16,456	— 2,300	7	92,177	96,404	— 4,227	"	311	286	304	515/16
	South Indian	2,531¾	20.5.37	115,482	+ 518	7	582,161	582,655	— 494	"	107½	1025/16	100⅛§	5½
Various	Beira-Umtali	204	Mar., 1937	85,489	+ 19,434	26	418,485	382,261	+ 36,224	—	—	—	—	—
	Bilbao River & Cantabrian	15	Mar., 1937	370	— 837	13	3,052	4,677	— 1,625	—	—	—	—	—
	Egyptian Delta	620	20.5.37	5,996	+ 307	7	30,891	28,015	+ 2,876	Prf. Sh.	21¼	15⅛	11½	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	Inc. Deb.	11½	1⅛	3½	Nil
	Kenya & Uganda	1,625	Apr., 1937	266,245	+ 21,428	17	1,117,191	992,425	+ 124,766	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	45	7¾
	Midland of W. Australia	277	Apr., 1937	13,052	+ 455	43	132,650	137,462	— 4,812	Inc. Deb.	97	93½	95§	4 5/16
	Nigerian	1,905	24.4.37	68,084	+ 37,905	4	255,443	122,352	+ 133,091	—	—	—	—	—
	Rhodesia	2,451	Mar., 1937	409,930	+ 129,028	26	2,109,905	1,726,146	+ 383,759	4 p.c. Db.	107	103½	107½	3¾
	South Africa	13,263	15.5.37	568,488	— 14,193	7	3,961,906	3,776,856	+ 185,050	—	—	—	—	—
	Victoria	4,728	Nov., 1936	868,988	+ 45,963	21	3,995,540	3,959,297	+ 36,243	—	—	—	—	—
	Zafra & Huelva	112	Mar., 1937	14,819	+ 5,299	13	44,012	30,750	+ 13,262	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

British Goods Abroad

THE early development of the diesel engine in Germany (both the original development and the evolution of road and rail engines), together with the continuous research carried on there and in other European countries, has tended to overshadow the work which has been done in Britain, and criticisms not infrequently are levelled at the number of firms which hold Continental licences. It is pleasant, therefore, to be able to record the outstanding success attained by certain English manufacturers in the European railcar world. It is over two years since the Soc. Italiana Ernesto Breda, of Milan, took out licences for the construction of A.E.C. oil engines, Wilson gearboxes, and Vulcan-Sinclair fluid couplings, and the Breda cars fitted with them have achieved a considerable amount of success. Including the orders now in production, well over 100 of these vehicles, each with two power-transmission sets, have been acquired by the Italian State Railways. The Vulcan-Sinclair fluid coupling is used extensively in Holland and France (and, of course, the German equivalent, made by Voith, on the German State Railways), but another market has been entered by the purchase of Wilson gearboxes and Vulcan-Sinclair couplings for installation in railcars built in Czechoslovakia. This equipment is to be used in conjunction with engines of 220 b.h.p.

Diesel Locomotive Exhaust

THE condition of diesel engine exhaust gases has frequently been the subject of investigation, particularly when consideration was being given to the use of diesel motive power in mines or tunnels. Just as frequently the smell of a diesel exhaust has come under criticism, but as far as can be ascertained it has been merely because the smell was unusual to noses thoroughly attuned to petrol engine fumes. Actually, fatalities have occurred in mines where small petrol locomotives or petrol-engined pumps and hoists were in operation, but so far as we have been able to trace there has been only one slight case of poisoning from the fumes of a diesel locomotive. This occurred in a mine, and was due to a mechanical defect preventing a full opening of the intake and exhaust valves, and thus the excess of air over the theoretical amount was insufficient to permit of complete combustion or to permit of the proper escape of all the burned gases through the exhaust. Granting that a sufficient volume of air is passing round the locomotive, diesel smell is noticeable only at first, but what is a minimum quantity of air for the dilution of exhaust gases for underground and tunnel work does not appear to be settled, and, of course, varies with the type of mine. In certain cases in Belgium it has been considered necessary to have an air flow of 7,000 to 10,000 cu. ft. a minute through the entry in which the locomotive is working, and this seems to be borne out by experience in the Saar, where an entry in which five diesel locomotives were working, showed practically no smell or obscuration with a passage of 50,000 cu. ft. of air a minute, although the humidity of the air was high. Exhaust gas cooling is usual for diesel locomotives operating in confined spaces, and this is essential should there be any trace of firedamp in the atmosphere, for although it is virtually impossible to cause an external explosion with a diesel locomotive in good condition, it is possible for flame to come out of either the exhaust pipe or the air intake of a locomotive badly in need of repair. The simplest form of cooling, as used in many small units, is to pass the exhaust through a nest of pebbles or iron balls sprayed with water, and in certain examples the exhaust is further passed through three or four sheets of safety-lamp gauze. In gaseous atmospheres a labyrinth of thin plates appears to be more effective than gauze, but more complicated devices appear to be necessary for outputs of over 100 b.h.p. A good number of users appear to try and limit the exhaust gas temperature at the atmosphere to a maximum of 70 deg. C. Sometimes a thin-plate labyrinth has been necessary on the engine air intake, where the maintenance and repair organisation has not been of the best. The danger of asphyxiation from the presence of CO in the exhaust appears to have been over-rated, and tests made on small units indicate only about 0·5 per cent., except in cases of seriously diminished excess air.

Propeller Cars

AFTER the phenomenal speed exploits of the Kruckenberg car in the early years of this decade, culminating in a maximum speed of 143 m.p.h., little notice appears to have been taken of the possibilities of such a form of traction. This may be explained partly by the extreme novelty of the idea and partly because of certain defects of the Kruckenberg car, not all of which were connected with the screw. A more workmanlike adaptation is now to be tried in France, where the Nord has ordered a twin-car train with a CLM-Junkers two-stroke engine and a large propeller at each end. This unit is intended for operation at speeds of over 110 m.p.h. where track conditions permit, and as at such speeds almost the chief requirement is adequate braking, the propellers are to be arranged to reverse and produce a retarding effect when a quick stop is to be made. This appears to be the first actual application of any form of wind brake, and is, of course, independent of the adhesion between wheel and rail. The Nord train is to be non-articulated and is to seat about 90 passengers within a length of 140 ft. and on an estimated tare weight of 50 tons. It is to have a conning tower drive, and is being built to the designs of M. Dumas, the Ingénieur en chef Adjoint du Matériel et de la Traction of the Nord, and M. Chatel. Apparently it is to have bogies of the usual type and will not be equipped with "steered" wheels as was the Kruckenberg vehicle. Oil-controlled pneumatic brakes are to be fitted for use in normal stops.

The Construction and Operation of Railcars

A summary of Question IV reported on to the International Railway Congress Association, and an account of the conclusions come to during the session now being held in Paris

REPORTERS: M. Dumas, Ingénieur en chef Adjoint du Matériel et de la Traction, Northern Railway of France, and M. Levy, Chef du Service du Matériel et de la Traction, French State Railways (France, Belgium, Holland, Portugal and overseas possessions; Great Britain and British Empire; Spain, Italy, Luxembourg); Herr Stroebe, Reichsbahndirektor, German State Railway (Germany, Poland, Denmark, Norway, Sweden, Finland, Austria, Hungary, Czechoslovakia, Jugoslavia, Bulgaria, Roumania, Turkey, Egypt); Mr. Wanamaker, Electrical Engineer, Chicago, Rock Island & Pacific Railway (America, China, Japan).

THE rapid development of single and multiple railcars during the past four years is ample proof of the perspicacity of the delegates to the Cairo Congress in calling for a report on the evolution, operation and testing of such vehicles. Actually, the question was considered of immediate interest, and what may be regarded as interim reports from MM. Dumas and Levy and from Mr. Wanamaker were published in the Congress Bulletin during 1934 and 1935.

Of the final reports, that by Mr. Wanamaker is short, apparently in view of his interim contribution, but also because of the paucity of the replies, for many North and South American railways with ample railcar experience have not seen fit to share their experiences. In both his interim and final reports Mr. Wanamaker keeps largely to descriptive matter and it is to be hoped that delegates from the two Americas will be asked to give information as to the actual operation of the various high-speed diesel trains and single-unit railcars.

Railcar Services

Although in several instances local conditions have brought about the introduction of railcars, the replies to the questionnaires sent out indicate that the desire to recapture traffic lost to road interests has been the prime reason for the railcar boom in all countries except North America. More particularly on the lighter type of railway, railcars frequently have more than made up any traffic previously lost to road transport, mainly by increased frequency of service, accelerated timings, cleaner travel, and stop-anywhere regulations. Certain railways with special requirements have considered economy in operation to be of greater importance than improved service and increased traffic, and *vice versa*, but it appears to be generally recognised that the desiderata of lower operating costs and better service are so closely related in the railcar sphere that they cannot be separated.

The severe business and industrial slump which followed the financial crisis of 1930-31 affected the railways of the highly-developed European countries to a greater proportional extent than those of the remaining five continents, with the result that railcar operation on the Continent far transcends that in vogue elsewhere, even in oil-producing countries, where, with the exception of Roumania, an impetus in railcar construction has been noticed only since trade became brisker. For example, France, Germany and Czechoslovakia each have over 500 railcars at work; in Italy there are over 300 and another 100 or so are on order. On the other hand, Argentina has fewer than 100 cars in service, and of this number at least 50 have been introduced only during the last 12 months.

Single-unit cars range in weight from 6½ to 111 tons, and in power from 50 to 600 b.h.p., but multi-unit trains range up to 1,200 b.h.p., and special train sets with two power cars, such as the Chicago—Denver trains of the Burlington and Union Pacific Railroads, up to 12 cars with an installed capacity of 3,000 b.h.p., plus separate plants for the auxiliaries. Mobile power houses are in use only on the Buenos Ayres Great Southern Railway. Vehicles powered by internal-combustion engines outnumber steam cars in the ratio of something like 20 to 1, and in the first class the diesel type is rapidly overtaking the petrol-engined car because of cheaper fuel costs and greater immunity from fire-risk in conjunction with similar or lesser maintenance costs. Except in countries where alcohol types of fuel are available in large quantities, *e.g.*, Czechoslovakia, diesel engines are almost universal for new construction.

Constructional Details

In all the reports, that part of the question dealing with construction has received the greatest amount of attention, and in the Dumas-Levy contribution, at least, this side has been dealt with so fully as to turn the report into a most valuable preliminary study.

Body and frame construction has probably received as much attention throughout the world as any other constituent of railcars, but certain aspects of it appear to have been recognised only in a few countries. One of these is the behaviour of the car in a collision. In the U.S.A. the high speed trains have noses as strong and rigid as it is possible to make them, and, most of the collisions occurring with automobiles or lorries, the railway vehicles go practically unscathed. In France, on the other hand, the driving compartment and engine-room portions of the framing are designed to deform and absorb the impact forces, and collisions with buffer stops, locomotives or other railcars have shown that while these end portions may be badly buckled, the passenger saloons sustain virtually no damage, and in a number of cases the windows have been unbroken. This principle of design appears to be growing in Europe.

Chrome-steel, nickel steel, carbon steel, high-chromium stainless steel, and aluminium alloys are used for those vehicles in which the body framing and underframing are constructed as an integral unit, but in cars with separate steel underframe and a wooden body frame such material as compressed paper has even been used for the side panels. In metal cars the complete framing may be designed in one of three ways, viz. (*a*) that in which all members take an approximately equal share in the stress distribution; (*b*) that in which the sides are the main members, with the roof and floor acting as ties; and (*c*) that in which roof and floor are the main constituents and the sides are merely connections. Welding is used considerably in all types, and in the cars made by such firms as Ganz, Fiat and Renault the whole structure is welded, and the bogies also are wholly or largely welded up. As a rule, the outer panel plates are not considered as adding to the strength of the structure.

The efforts made to improve the riding of all types of

cars—by means of special springing, novel types of bogies, elastic wheels, parallel and 1 in 40 taper tyre treads and the like—are given a good deal of space, but most of the matter is descriptive. It is probable that these questions, and also the use of hydraulic shock absorbers, will be ventilated thoroughly during the discussions at the Congress meeting, for they are of considerable importance. Considering the matter broadly, the best-riding vehicles are those which run at the highest speeds, *e.g.*, the Reichsbahn *schnelltriebwagen* and the Northern Railway of France triple-car trains, but in both these instances considerable assistance in the production of a smooth-riding set is received from the excellence of the permanent way.

Retardation has proved one of the greatest problems connected with the operation of railcars. This was expected more or less so far as high-speed rakes were concerned, but a considerable amount of investigation has been necessary on small and medium-sized cars in order to produce a reliable and efficient system if brake blocks on the wheel rims are not desired.

It has been established that at speeds of about 100 m.p.h. (160 km.p.h.) braking forces of 300 per cent. of the weight on the wheels are possible without sliding, and in the multi-car trains running at 95-105 m.p.h. ratios of 200 per cent. are used in regular service. With the use of air brakes under such conditions, the principal work has been the development of retardation controllers to reduce the high initial braking effort with the gradual reduction in speed. Retardation peaks as high as 6 m.p.h.p.s. have been recorded, but the maintained rate is about half this figure.

Electro-magnetic brakes are used mainly for emergency applications, but there is a very wide divergence of opinion as to the merits of this system, many railways considering that the weight, current consumption, and difficulties of application under all track conditions are not counterbalanced by the high rates of retardation. Certain railways have developed electro-magnetic braking to give successful service results, but the whole question needs more attention.

Power Plant and Transmission

Engines and transmissions of various types are described in the reports, but little effort has been made to discuss them critically, either in aspects of design or behaviour in traffic, although considerable experience has been gained. From a consideration of the types of engines used it is evident that there has been a realisation that high rotational speeds and light weights do not necessarily result in high maintenance costs, and, in general, advantage is being taken of the small bulk and weight (and the resulting decreased size of the transmission) of the high-speed engine. Insofar as Europe is concerned, speeds of 1,400-1,500 r.p.m. are found in the 300-600 b.h.p. range, and up to 2,000 r.p.m. in the smaller sizes. Satisfactory designs, drives and arrangements of the various auxiliaries are by no means universal, and an investigation over a wide area indicates that at least as many failures are due to auxiliaries as to the main power plant and transmission.

Mechanical, electric and partial-hydraulic systems of transmission are all used widely, and except in countries where a variety of industries must be fostered for political reasons, the choice depends upon local conditions. But as time goes on these local conditions are becoming more and more influenced by the increasing flexibility of the oil engine, which allows the use of mechanical transmission under conditions where previously an electric system would have been deemed essential. On the other hand, the weight and price of electric transmissions have been reduced, and while this system is still ubiquitous in large powers it has been applied in sizes as low as 100 b.h.p. Combinations of electric and mechanical transmissions are now being used experimentally. Under certain conditions hydraulic transmissions may offer special advantages from the braking point of view. A special modification is necessary, but on the Reichsbahn this has not led to complication.

Operating Costs and Experience

The problems of maintenance and repair are of such great importance that the small magnitude of many railcar construction programmes may be traced directly to qualms concerning them, often not because of any inherent fear that the vehicles will always be in the shed, but because it takes far longer to train the average personnel to operate and maintain with some efficiency an entirely new form of motive power than it does for the engineering staff to evolve and perfect new modifications of existing machines.

It is difficult to say which is of the greatest importance: training the driving staff or building up a maintenance and repair organisation. The increasing efficiency of the personnel with growth of experience may be more than sufficient to offset the greater need of attention with the increasing age and mileage of the vehicles. A concentration of all but the daily and weekly maintenance routine at one depôt appears to have much to commend it, for apart from the desirability of keeping the repair in the hands of intelligent workers with specialised knowledge, it is but rarely that finances will allow of the purchase of two or three sets of the special machine tools, hand tools and measuring instruments that are necessary. Examples of these railcar repair depôts are to be found at Rennes (French State Railways), Florence (Italian State Railways), Louvain (Belgian National Railways), and Wittenberge (German State Railway).

Maintenance and repair may be undertaken by the makers of the railcars at an agreed sum per mile; arrangements on this basis are in force on the Great Western Railway (A.E.C. railcars) and on various systems, in three continents, using Ganz cars, and it would be interesting to know if railways operating a reasonable number of cars can maintain and repair their vehicles as cheaply as by a contract method. On occasion, this system is adopted only for the first two or three years.

Actual costs of operation vary enormously, but we have yet to come across an example in which a saving could not be made compared with steam traction. Of course, the palm is held by the 75 b.h.p. diesel cars of the County Donegal Railways (Ireland) which have operated at a gross cost (including capital charges and heavy overhauls) of about 3d. per mile for three to five years. MM. Dumas and Levy quote the Czechoslovak State Railways, on which system the operating costs, including depreciation, amount to 7 crowns per train-mile for diesel-electric cars and 15 crowns for the replaced steam trains, but on the basis of cost per 100 seats the figures were the same, the gain being mainly in the fact that the railcars gave the seats that were actually wanted, and gave them at a reduced weight and an increased speed.

On the Buenos Ayres Pacific Railway the average gross operating cost taken over a variety of cars is $0·565 (paper) per mile compared with $2·14 per train-mile with steam traction. Interesting figures from the Belgian National Railways show that three 100 h.p. Sentinel steam cars averaged about 4·0 Belgian fr. per mile in local service over an aggregate mileage of 235,000 in two years, and three 150 b.h.p. diesel-mechanical cars covered 240,000 miles in the same period at a cost of 3·3 fr. per

mile; in neither case are interest and depreciation charges included.

CONGRESS SUMMARY

The consideration of the three reports at the Congress meeting took place on June 3 and 4. After a summary of the three reports had been given by M. Dumas, discussion took place on each of the nine sections into which this summary had been divided. The cylindrical and 1 in 40 coned treads used on some high-speed train sets were given some attention; it was stated that on the Northern Railway of France these tyres were made of a special steel with a tensile strength of 100 kg. per sq. mm. (63½ tons per sq. in.) and that those used on the German State Railway super-speed trains were of 80-92 kg. per sq. mm. (51-58 tons per sq. in.). Air-conditioning applied to railcars was discussed, and Mr. Sakr (Egyptian State Railways) stated that the American type of refrigeration had given unsatisfactory results on account of the humidity of the air. For short journeys, M. Bloch considered that it was sufficient to have ice-cooled air circulated by a ¼ h.p. fan.

Conclusions

Eventually the following summary and conclusions to Question IV were sanctioned:

I.—Satisfactory technical solutions have been found in the course of the last two or three years to the speed, acceleration, braking and safety problems. The future of the railcar now depends on the solutions that will be adopted as regards comfort, economical maintenance and capacity. This future also depends on future improvements of the track (curves, superelevation, elimination of rail joints or reduction of their number), and especially on the mutual adaptation of operating methods and the railcar.

II.—Railcar diesel engines can be divided into three classes:

(*a*) 600 b.h.p. and over; relatively heavy, but very economical as regards working and maintenance; such engines are used extensively in the United States of America.

(*b*) 300 to 600 b.h.p. engines weighing about 5 kg. (11 lb.) per b.h.p., as adopted by most European railways.

(*c*) Engines up to 300 b.h.p., amongst which the Czechoslovak, German and French horizontal engines deserve special mention.

By the use of supercharging, which tends to extend, the power/weight ratio of engines can be improved; improved behaviour of the motion and better dissipation of the lost heat units are also obtained.

III.—Mechanical transmissions are quite satisfactory, as regards weight, cost and efficiency, up to 300 b.h.p., and allow the coupling up of two or three vehicles. Mechanical transmissions for 450 and 500 b.h.p. are being tested in Italy and in France. Electrical transmissions are now fully perfected for all powers, giving full satisfaction for services on mountain lines and for multiple-unit working. Hydraulic transmissons have made definite progress in the course of the last two years, in respect of all powers and engine speeds, in Austria and Germany; they also allow of multiple-unit operation, even when coupled up to electrical transmission units.

IV.—All administrations are adapting the suspension of their railcars to the permanent way as it is at present constituted and maintained. In order to reduce to a minimum the vertical movement of bogies, and to improve comfort, railways are now using wheel tyres coned 1:40, cylindrical tyres, multiple suspension gear and rubber shock absorbers. Such devices have not given rise to any difficulty, and their use can be recommended. Some administrations also use devices to damp out hunting movements and vertical vibrations, bogies (articulated or not) with six or eight wheels, loose wheels revolving on fixed axles, axleboxes without axleguards, &c. All these solutions have given them satisfaction.

V.—Block brakes are most generally employed at present; they are electrically controlled in certain countries (U.S.A., Czechoslovakia) and improved, in the case of high speed working, by the use of a Decelakron or regulators giving pressure on the blocks, which increases with the speed. Amongst new brakes the disc brake, the eddy-current brake and the N.R. brake with double shoes, should be mentioned.

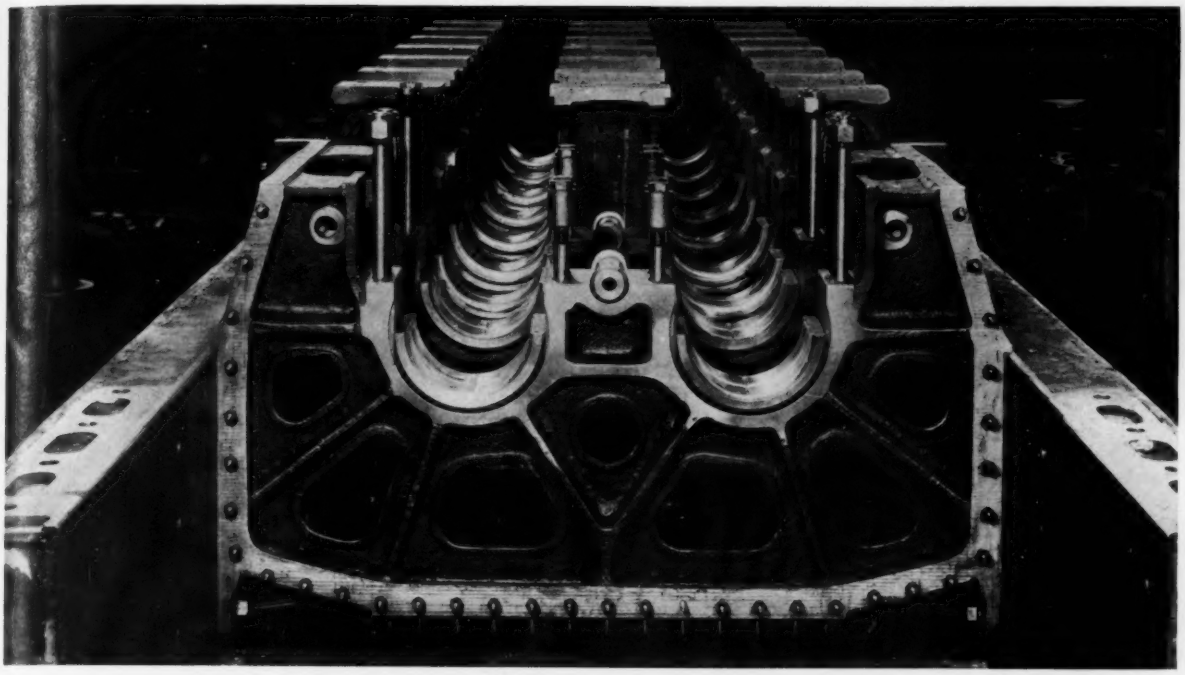
VI.—Sound-proofing and air-conditioning are particularly resorted to at present in order to increase comfort. Steel-tyred vehicles—although they cannot claim the same comfort as pneumatic-tyred vehicles—can be improved from the point of view of noise particularly by double partitions with air cushions, of pulverised felting, rubber, and the careful stopping up of all openings. Air conditioning, and air cooling in summer (by means of ice or freon), are particularly appreciated in vehicles with fixed window lights.

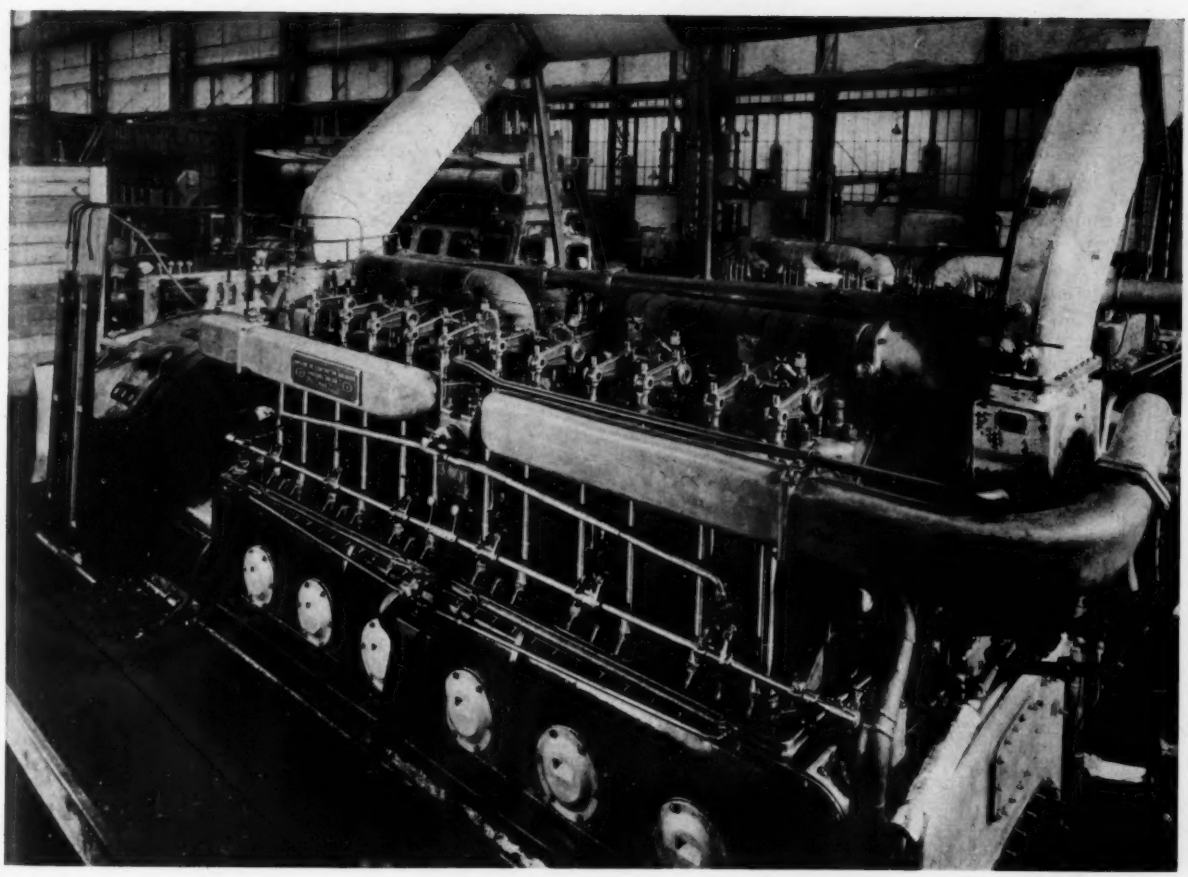
VII.—Maintenance costs and amortisation charges are the biggest items in the cost price of diesel-engined cars. Several administrations are seeking above all a reduction of maintenance costs by using relatively slow motors of heavy construction. Other administrations desire maximum lightness in order to increase the possibilities of the railcar and to reduce the running cost; they consider that the progress made in the matter of lightening will allow them to arrive at a reasonable maintenance cost. The Congress considered it desirable that the railways agree to calculate in a uniform way the coefficient of use of their railcars and their cost price.

VIII.—Most administrations in order to improve their operating cost and to give satisfaction to the public, tend to replace their train services by railcar services and, in this connection, to increase more and more the capacity of the railcars. As regards general design various solutions are being resorted to: railcars with engines placed underneath the floor, twin-railcars, or single railcars coupled together, railcars hauling trailers, and multiple units.

IX.—The Congress considered it desirable for the railway administrations to adopt a common test method for ascertaining the characteristic constants of their railcars. On the other hand, the nominal power of internal-combustion engines should be given the same definition in all countries.

PARIS EXHIBITION.—Among the large number of railway exhibits at the Paris International Exhibition are included the following: a 400 b.h.p. Bugatti railcar with Cotal electro-magnetic gearboxes; a Renault 300 b.h.p. car; a 420 b.h.p. two-engined "standard" car with SLM-Winterthur mechanical transmission; a 96-seater three-bogie single-unit Michelin; a Danish three-car *Lyntog* train; a small Swedish four-wheeled car with a 100 b.h.p. engine; a 95 b.h.p. Gardner engined railcar of the Belgian National Light Railways; a 1,400 b.h.p. diesel-hydraulic locomotive with Voith transmission from the German State Railway; and a selection of German diesel engines and a set of Voith hydraulic drive as used on the Reichsbahn. During the last three months of the Exhibition one of the triple-car Fiat diesel-mechanical trains of the Italian State Railways will be on show.

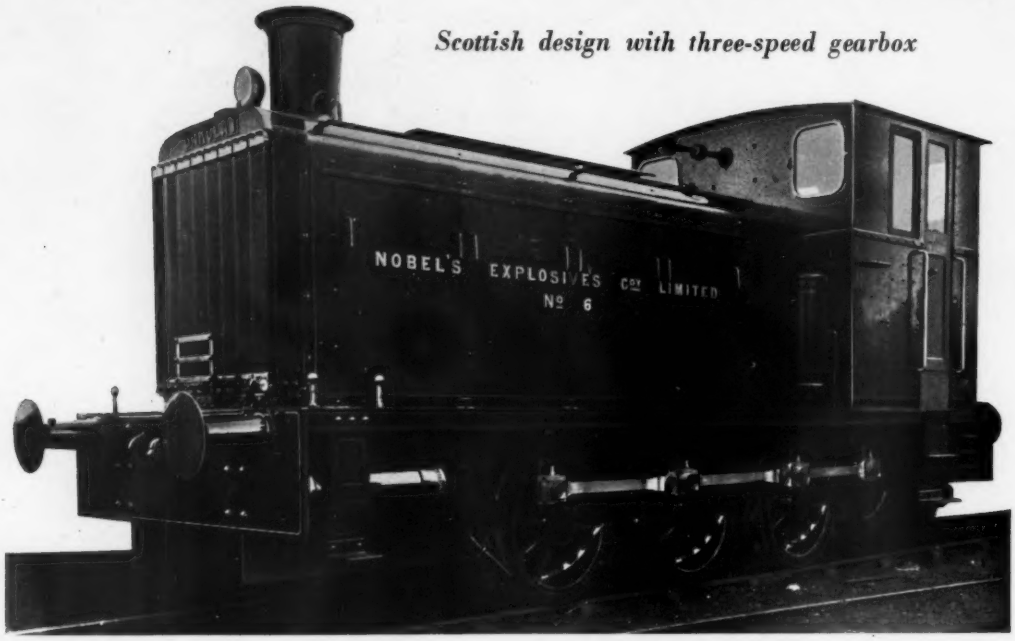




Two views of the new Sulzer 2,200 b.h.p. 12-cylinder twin-crankshaft oil engine for the P.L.M. 4,000 b.h.p. locomotive. This engine was described in detail in our issue of May 14. Both views were taken in the St. Denis works of the French Sulzer Company. In the lower view the main generator and step-up gears can be seen

Diesel-Mechanical Locomotive for Industrial Shunting

Scottish design with three-speed gearbox

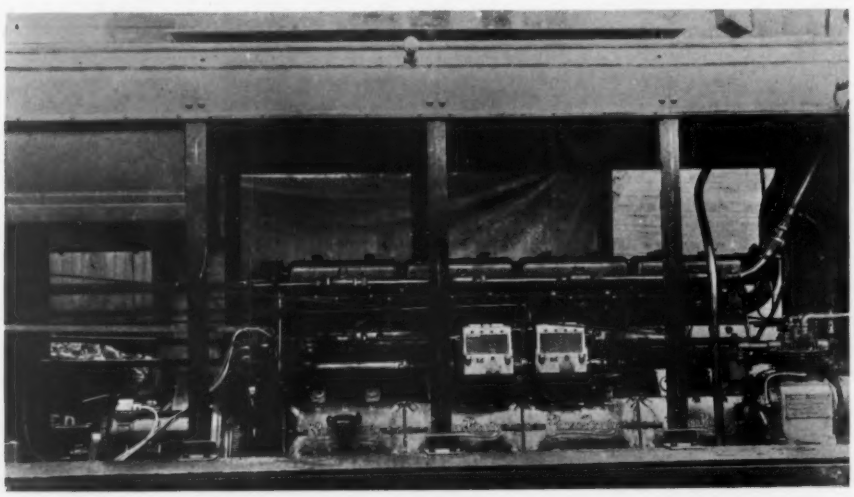


30-ton diesel-geared locomotive with 8 ft. 6 in. wheelbase for the I.C.I.

AMONG diesel locomotives set to work in Britain recently is a six-wheeled machine built by Andrew Barclay, Sons, & Co. Ltd. for the Nobel Explosives branch of Imperial Chemical Industries Ltd. It is constructed on Barclay's usual lines, and its appearance is very similar to one of that company's standard steam locomotives.

The power unit is a Paxman-Ricardo four-stroke engine developing 180 b.h.p. at 1,100 r.p.m. in six cylinders 5·5 in. bore by 7·0 in. stroke. The fuel is injected through C.A.V.-Bosch pump elements and nozzles at a pressure of 1,800 lb. per sq. in.; the compression pressure is about 550 lb. per sq. in. and the maximum gas pressure about 780 lb. per sq. in. Engine-driven water and oil pumps are used, and electric starting is incorporated, the starter motor being of the C.A.V.-Bosch type with a pinion meshing with the toothed rim of the flywheel. Current for starting and for lighting is obtained from 24-volt 105 amp. hr. batteries which are charged from a dynamo driven by a vee belt from a pulley on the hydraulic coupling casing flange. The engine lubrication system includes a tell-tale device which lights a red globe on the driving dashboard if the oil pressure drops below 7 lb. per sq. in.

The normal engine speed control operates through the governor, and irrespective of the load maintains the rotational speed constant at any value selected between the idling speed of 300 r.p.m. and the full load speed of 1,100 r.p.m. An independent control is connected direct to the fuel pump to stop the engine in an emergency. The Reliance radiator is formed of detachable sections and is located at the front of the bonnet. Behind the radiator

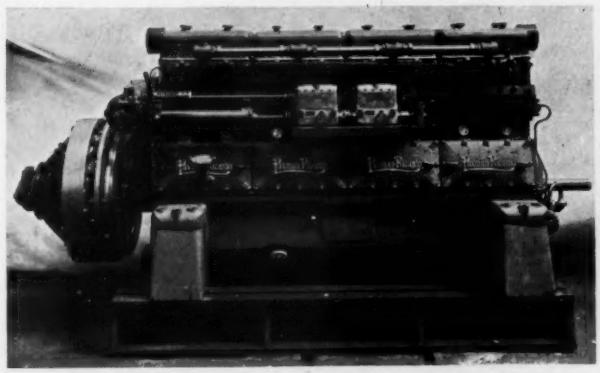


Installation of Paxman-Ricardo engine with its auxiliaries, Vulcan-Sinclair traction-type fluid coupling, and one of the two compressors in the I.C.I. shunting locomotive

bank is a fan belt-driven from the engine crankshaft. One of the radiator sections is used for oil cooling, and an immersion heater is fitted in the water circuit to keep the water warm while the engine is standing in the shed in cold weather. The flow of water through the radiator is controlled by a thermostat, and part of the cooling water is by-passed through the cab for heating purposes. The fuel tank capacity is 100 gal.

Mechanical transmission is used, and comprises a Vulcan-Sinclair fluid coupling; a cardan shaft with two flexible couplings; a three-speed Wilson epicyclic gearbox; a Bostock & Bramley reverse and final drive, incorporating the jackshaft; and the flycranks and rods transmitting the torque finally to the wheels. The Wilson gearbox has ratios of 3·06, 1·58, and 1·0 to 1, and with the 37·5 in. wheels and normal full load engine revs. gives track speeds of 4, 8, and 12 m.p.h. in each direction with corresponding rail tractive efforts of 12,650, 6,660, and 4,210 lb. The band brakes of the Wilson box are operated by compressed air controlled by a single valve in the cab. The reverse gear is hand operated. All the controls in the cab are duplicated so that the driver can operate from either side.

Westinghouse air brakes, with a single cylinder beneath the cab, apply blocks to all wheels, and the rigging is connected also to a hand brake. There are two compressors, one of which is a standby, and the gearbox air is taken from the brake compressor through a reducing valve. In working order the locomotive weighs 29·5 tons.



Eight-cylinder 180 b.h.p. Paxman-Ricardo engine

Publications Received

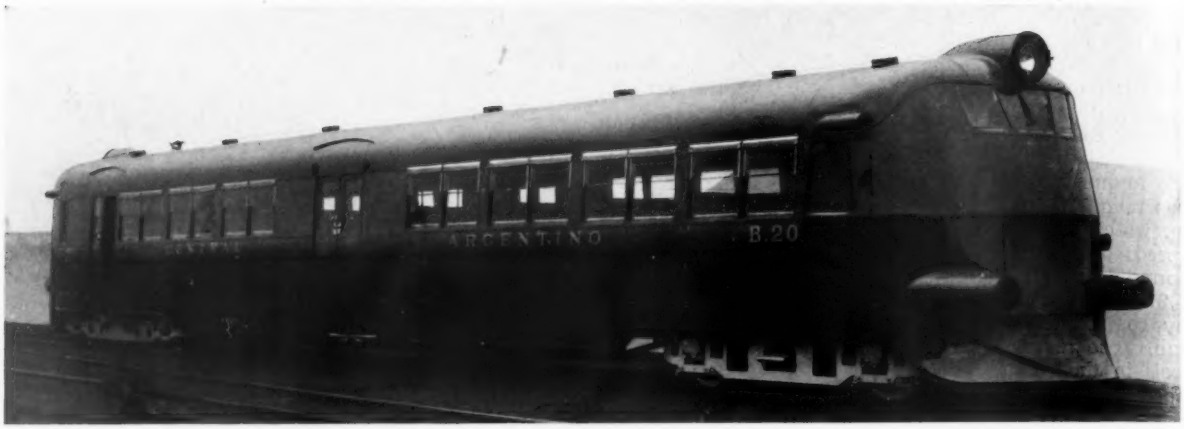
The Lead Storage Battery. [Third Edition.] By H. G. Brown, A.M.I.E.E. London: The Locomotive Publishing Co. Ltd., 3, Amen Corner, E.C.4. 8½ in. × 5½ in. 202 pp. Price 5s. net.—This well-known book covers the whole theory and practice of the lead type of battery, and for such a book there is a large potential field, as battery design and manufacture are extremely specialised, while battery users are legion and largely ignorant of the product they handle. Moreover, this is one of the few technical books which actually are suitable for both trained engineers and mechanics. As given in the body of the book, the theory of a battery and the formation and construction of the plates are treated shortly and simply, although quite adequately, and the excellent plan of discussing the ionic theory in an appendix has been adopted. The reader, therefore, may read it or not, as he prefers, without hindering his understanding of the remainder of the book. Descriptions are given of the various types of cells and their characteristics, *e.g.*, stationary, portable, and traction, and if the sequence in which these chapters is arranged may not appear to be logical, the contents are at least self-contained. Other chapters deal with emergency lighting equipment, boosters and auxiliaries. A great deal of space is devoted to battery working in its numerous phases, and plenty of good advice and instructions are given on charging, recording, normal maintenance and inspection, and testing, including the reproduction of a colour chart for the acids. In this section, again, the sequence does not seem quite logical although the information is of the best. The illustrations in the section on battery vehicles need some revision, for not one of the railway vehicles shown was built during the present decade. The major defect of this work is that it keeps to its title, and does not cover nickel-iron and cadmium-nickel batteries, and additional chapters, or another volume in exactly the same style, would be valuable.

La Technique des Industries du Pétrole. Paris: Science et Industrie, S.A., 29, Rue de Berri, 8e. 12½ in. by 9½ in. 200 pp. Illustrated. Paper covers. Price 35 fr.—From June 14 to 19 the Second World Petrol Congress will be in session at Paris, and with this meeting in view the present special volume has just been issued. The first part of the work is devoted to the five sections of the Congress, viz., geology, chemistry, material and construction, utilisation, and economics and statistics; in each case a brief review of the field covered is given by a French technician. Broadly speaking, the remainder of the book covers these same five sections, but without any attempt at grouping, and with diversions such as a description of the plant and docks at river and sea ports handling a large petrol traffic. Trial results with similar engines using different types of petrol fuels form an integral chapter, which is followed by a discussion of the characteristics and methods of production of fuels with very high octane numbers. Petrol refining is dealt with in some detail under two main headings: (*a*) the adaptation of existing plants to the production of modern fuels, and (*b*) the provision of adequate safety and hygienic measures in refineries.

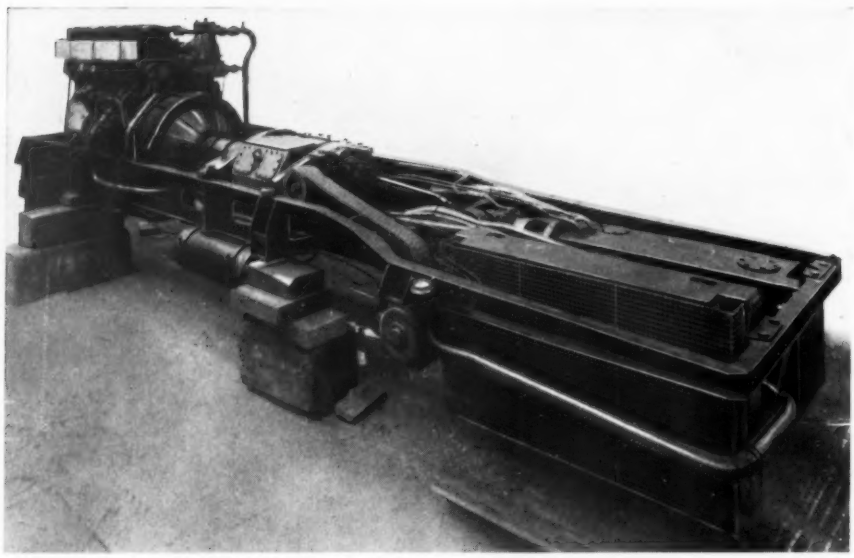
The Modern Diesel. Fourth (Revised) Edition. London: Iliffe & Sons Ltd., Dorset House, Stamford Street, S.E.1. 7½ in. × 5 in., 224 pp. Fully illustrated. Price 3s. 6d. net.—The rapid development of the high-speed light-weight diesel is reflected by the short time which has elapsed between the publication of the third, fourth, and fourth (revised) editions of this book. Intended principally for users of road transport vehicles, special attention has been paid to the explanation and characteristics of fuel injection pumps and systems. The question of combustion is studied in relation to the various types of cylinder heads. Condensed illustrated descriptions are given of all the leading road transport engines made in, or represented in, Britain, and there is a useful comparative table giving the leading dimensions, ratings, and fittings of over 50 different models in powers ranging from 20 to 160 b.h.p. and running at 1,500 to 2,600 r.p.m. Commendably brief chapters on high-speed engines for railway, aviation and marine work complete the book. The railway section comprises a dozen pages, and very sensibly the editors have not set out to give a survey of the whole railway field, but have merely indicated the extent to which high-speed engines of the type derived from road transport models are used in railcars and light locomotives. All the line illustrations are clearly drawn and assist considerably in the explanation of those constituents with which every operator must be thoroughly familiar.

Broad-Gauge One-Class Railcars for Argentina

Single-unit vehicles to replace local steam trains in the Rosario area



Above: General view of 275 b.h.p. diesel car for solo operation, Central Argentine Railway



Left: Engine, fluid coupling, gearbox, drive, radiators and engine auxiliaries on subframe ready to lower into position on the power bogie

FOUR double-bogie all-steel diesel-mechanical railcars of 275 b.h.p. have been completed by the Birmingham Railway Carriage & Wagon Co. Ltd. for the broad-gauge lines of the Central Argentine Railway. They do not incorporate standard buffing and drawgear, and will normally be used in solo operation. Actually, the complete contract includes also two twin-unit articulated sets each with two 275 b.h.p. Armstrong-Sulzer engines, and a spare power bogie suitable either for the single or twin vehicles. Two of the four single cars are fitted with Wilson epicyclic gearboxes and Vulcan-Sinclair fluid couplings; the two remaining single-unit cars and the two articulated rakes have S.L.M.-Winterthur gearboxes. All vehicles have been built to the requirements of Mr. W. P. Deakin, Chief Mechanical Engineer of the C.A.R., and to the supervision of Messrs. Livesey and Henderson, the railway company's consulting engineers.

Body and Underframe

The underframe is built in one with the body framing, and is an all-welded structure comprising two main longitudinals of lattice girder formation with angle truss outriggers supporting the side sills and body side attachments. The longitudinals stop short of the power bogie, and from there forward the main members are at the sides. These members are plate fabrications designed to splice with the longitudinals, and to engage with the power bogie bolster.

The body framing is of light-gauge steel pressings, and the pillars and carlines of flanged U section are arranged to form a continuous hoop round the body. The cantrails are Z pressings welded and made continuous round the body. Light alloy window frames are riveted in position and form the waist rails. The whole of the exterior panelling is of aluminium alloy sheets. The floor is formed of galvanised dovetail steel sheeting covered with treated cork and finished with sponge-backed rubber.

The interior panelling and partitions are of all-metal construction finished with Rexine in two shades of brown, and with the ceiling painted broken white. The inside of the outer panels and back of the interior panels are sprayed with asbestos to avoid drumming and provide

insulation against noise and temperature changes. The underside of the floor is also sprayed with asbestos finished with a hard coating of cement.

Accommodation is provided for 75 seated passengers in one class, and there are a lavatory and a luggage room. Wide centre vestibule entrances are fitted which, together with the clear floor space immediately inside the vestibule and wide gangways, allow of easy entrance and exit, and form ample standing accommodation to cope with peak traffic conditions. A driving cabin is situated at each end of the car.

Bus type half-drop windows, of the latest Widney-Stuart type with stainless steel frames and fittings, are used in the passenger saloon and luggage compartment, and Alpax louvres are fitted in the passenger saloons. Both windows and louvres have identical top bars, hand catches and side racks to facilitate maintenance. Venti-louvres are fitted over all saloon half-drop windows. The seats are of large proportions and are widely-spaced to give a high standard of comfort. The upholstery is finished in brown Rexine to tone with the interior decorations and the rubber on the floors. The vestibule entrance doors are of Alpax, arranged to slide into pockets, and provision is made for fitting air-control motors at a later date if required.

Stone's pressure ventilating and heating system is fitted in order to maintain a fresh air condition, free from dust or draught, within the car during all seasons of the year. When required, the temperature of the air in the car can be brought up to the required degree by taking the waste heat from the engine cooling water and imparting it to the incoming air under the control of thermostats. The heating system is operated by diverting the engine cooling water through a coil located in the Stone's equipment cabinet. The coil is placed in the stream of incoming air, which is heated and then distributed throughout the car by means of ducts under the floor connecting to the seat pedestals. Apertures are fitted in the pedestals permitting the air to flow into the compartment without turbulence or draught. Diversion of the cooling water is thermostatically controlled to safeguard the engine.

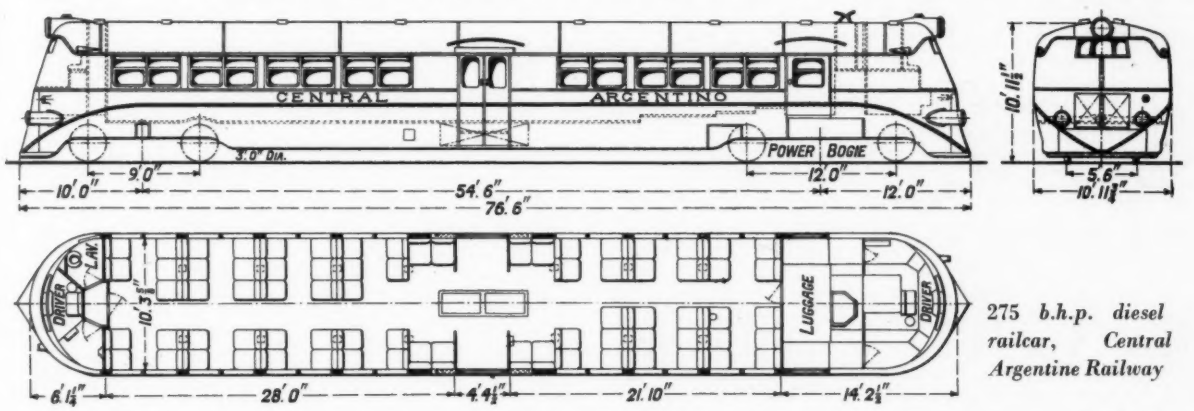
The electric lighting equipment also is of Stone's manufacture, and magnetic switching is incorporated to give three main lighting control points—engine end cab, centre vestibule, and trailing end cab. The outside of the car is finished entirely in red with Docker Bros. Syntholux paint; there is a black line along the waist which is brought down towards the track at the ends and round the nose of the vehicle, which forms the cowcatcher.

Bogies and Brakes

Both power and trailing bogies are of welded construction with box-type frames, and are to designs patented by the car builders. Timken roller bearings are used in all the axleboxes. The wheels are of a special light type with discs sprayed with asbestos to reduce the ring. From the accompanying general illustration of the car it will be noticed that the suspension differs from that of the bogies (all power) of the Entre Rios cars by the same builder (illustrated on page 347 of our issue for February 19) in that the axlebox springs are of the helical type and the bolster springs are laminated. In the trailing bogie each axlebox has two helical springs mounted by means of an equalising beam over the box, and with rubber auxiliary springs. At each side of the bolster is a quadruple elliptic spring mounted on Balata pads.

Brake drums are bolted to the wheel discs and the shoes applied by Girling brakes, actuated by air and controlled by self-regulating equipment made by the Consolidated Brake Co. Ltd. An electro-pneumatic dead-man handle device is incorporated in the brake system, and is interconnected also with the engine and gearbox control.

The design of the driving bogie enables practically all the engine, transmission, and auxiliary equipment to be brought together and mounted as one unit on the bogie structure. The engine, gearbox, auxiliary drive, dynamo, compressor, radiator, fuel tank, interconnecting piping and control gear are assembled on one subframe passing throughout the main bogie frame. This subframe is insulated from the bogie frame by means of Silentbloc mountings with special holding down attachments having conical seatings to facilitate location of the subframe when dropping it into position. Slinging points are provided on the subframe, so that it can be removed for inspection and maintenance.



275 b.h.p. diesel railcar, Central Argentine Railway

Engine and Auxiliaries

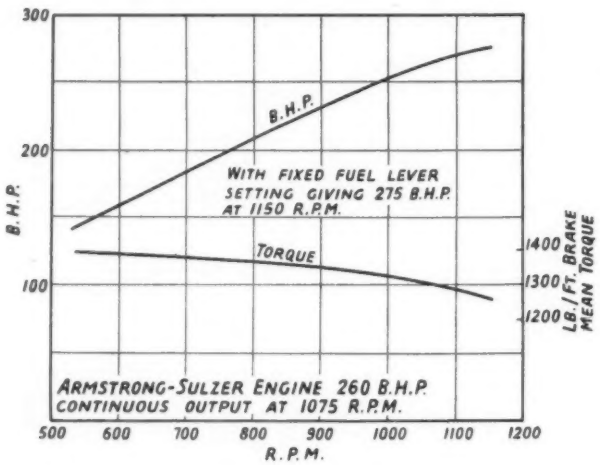
Power is provided by a four-stroke Armstrong-Sulzer engine with a continuous output of 260 b.h.p. at 1,075 r.p.m., and a maximum output in the present installation of 275 b.h.p. at 1,150 r.p.m. These engines were illustrated and described in the issue of this Supplement for November 27, 1936, and therefore only a brief recapitulation of the main features is necessary here.

The six cylinders have a bore and stroke of 190 mm. by 230 mm. (7·5 m. by 9·1 m.), and on the continuous rating the brake m.e.p. is 80 lb. per sq. in. and the piston speed 1,625 ft. per min. At maximum normal load the fuel consumption averages 0·4 lb. per b.h.p. hr. and at 75 per cent. load, 0·43 lb.

A single-piece casting forms the cylinder block, and it is bolted to a fabricated steel crankcase, the lower portion of which is designed to suit three-point mounting. A large cast aluminium sump is bolted to the bottom of the crankcase. The cylinder heads are independent and each houses one inlet and one exhaust valve. The pistons are

of aluminium alloy and have four compression rings and upper and lower scraper rings. The single piece crankshaft runs in seven whitemetalled steel-backed bearings, the caps of which are held down by bridge pieces cottered into the crankcase structure. The valve camshaft is driven by a train of helical gears, and on the other, or exhaust, side of the engine is another camshaft operating the fuel pumps and governor gear. The governor itself is arranged to give infinitely-variable speed throughout the speed range of the engine. An Auto-Klean filter is fitted in the fuel line.

The engine is electrically started, and the starter control circuit is wired through the gearbox forward and reverse controller which becomes the master switch for the whole control system. The engine speed is pneumatically con-



Horsepower and torque curves of engine used in Central Argentine railcars

trolled, and the engine stopping is effected through solenoids. Warning lights are fitted on the driver's control panel indicating lubricating oil pressure, water temperature and the setting of the gearbox in forward or reverse.

The Serck radiator is of the interchangeable sectional type with water and lubricating oil sections. The fan drives air from inside to outside of the radiator and cooling is equally effective regardless of direction of travel. The piping connecting the radiator to the engine is self-contained on the subframe, with a diversion point arranged to feed water through flexible pipes to the Stone's heating coil. A further flexible connection permits replenishing from the 100-gal. water tank beneath the underframe, the water being lifted by means of a hand-operated semi-rotary pump.

The radiator overhangs the rear end of the bogie and the fuel storage tank is fitted alongside. This tank has a capacity of 85 gal. and is filled by means of large-bore filler pipes extending to both sides of the subframe, and readily accessible through flaps in the side of the car. The fuel is drawn from the tank by means of a lift pump on the engine which transfers the oil through Flextel universal couplings to a 15 gal. header tank mounted over the engine casing in the engine compartment, and giving a final gravity feed to the engine.

At the rear of the engine casing a shaft extends to the roof and contains the silencer, which is mounted in a special manner to allow for bogie movements. The silencer also is arranged so that it is automatically released from the engine when the body is lifted, and it is held in position with special suspension gear so that it drops to position when the body is replaced. In position, the power unit projects above floor level, and an insulated covering is built over it with hinged and removable flaps giving access to the engine and transmission.

Transmission and Controls

Both the S.L.M.-Winterthur and Wilson gearboxes incorporate forward and reverse drive and five speeds in each direction, the top track speed with normal engine revolutions being 68 m.p.h. The S.L.M.-Winterthur boxes were made by Armstrong-Whitworth.

The final-drive cardan shafts extend fore and aft, and drive both axles through Bostock & Bramley worm drives. The S.L.M.-Winterthur gearbox is bolted directly to the subframe, but the input shaft, driven from the engine through the medium of a spring elastic coupling mounted in the engine flywheel, has two universal couplings to allow for the vibratory movements of the engine on the rubber mounting. The Wilson gearbox has a three-point attachment to the subframe with rubber mounting, and the input shaft also is fitted with two universal joints. All universal couplings are of the Standage type. The Vulcan-Sinclair hydraulic coupling for the Wilson transmission has an outboard bearing carried on a fabricated bracket attached to the engine. The subframe is so designed that very little work would be involved in an eventual change-over of gearboxes.

Following the gearbox the remainder of the equipment on the subframe is identical, and with both types of gearbox the auxiliary power take-off is by means of a pulley, set at right angles to the transmission line, which drives a countershaft through a triple Brammer vee belt drive. The countershaft is mounted in self-aligning plummer blocks on a sliding cradle which permits adjustment of belt tension. Brammer vee belt drives from the countershaft drive the dynamo, air compressor and radiator fan, and in each case there are screw adjustable mountings to provide for belt tensioning.

Both the S.L.M.-Winterthur and Wilson gearboxes are electro-pneumatically controlled. In the former, the electro-pneumatic valves are mounted on a separate manifold, and admit air to a special control cock on the rear of the gearbox which directs the oil pressure to the respective gear clutches. The electro-pneumatic valves for the Wilson gearbox are mounted on the gearbox itself, and admit air direct to the cylinders operating the epicyclic band brakes.

The control system is designed to suit either the S.L.M.-Winterthur or Wilson power bogies so that the power units are interchangeable in all cars. An S.L.M.-Wilson selector switch is incorporated, and when making a change-over this switch is appropriately set and a portion of No. 1 segment on the gear controller drum is removed for the Wilson box. This is necessitated because No. 1 position operates the starting clutch for the S.L.M.-Winterthur box and resets the overspeed governor on the Wilson box.

Both hand and foot dead-man emergency devices are provided, and both must be released to make an application. In the event of an emergency application being made, full reservoir air pressure is applied to the brakes. The rapid fall in pressure in the brake line operates an auxiliary valve in the engine speed control line, causing the air to be cut off and the engine control cylinder to exhaust, so that the engine speed falls to idling. At the same time the electric supply to the electro-pneumatic valves controlling the gearbox is broken and the gearbox returns to neutral.

Removal of the power unit is a comparatively simple matter. The car is jacked up at the special pads provided, and when high enough to free itself from the special bolster the body is automatically in position for the com-

plete unit to pass out through the hinged doors in the end of the car, the cowcatcher and the detachable portion of the headstock being removed.

The driving cabs are identical and each is fitted with an upholstered seat. The warning lights and gauges are grouped on a central illuminated panel which is fitted with a 24-hr. clock. At the engine end a recording speedometer is fitted, and at the other end is a non-recording instrument. Sanding pedals, brake hand wheel, and a switch panel adjacent to the driver's right hand are included also. The headlight beam can be directed horizontally by means of a foot treadle to illuminate approaching curves in the track, and a powerful spotlight fitted in the roof of the cab throws a vertical beam, which is intended to distinguish the railcars from road traffic when operating on unfenced tracks.

Big South American Developments

Principally as a result of the undoubted success of the Ganz diesel railcars on the Argentine State Railways (*Diesel Railway Traction Supplement*, May 15, 1936), the Argentine Government has authorised the purchase of 50 further cars at a cost understood to be $5,000,000 (paper), a step which was foreshadowed in the issue of this Supplement for December 25, 1936. First orders for two three-car diesel-mechanical trains have been placed already, with Ganz & Co., of Budapest. Each of these trains is to consist of a 320 b.h.p. railcar at each end with a trailer in the middle, and the total seating capacity will be about 160. Hot water heating and air-conditioning will be included, and the power of the Ganz oil engines will be transmitted through five-speed gearboxes with electro-pneumatic remote control. These cars are intended for service on the 5 ft. 6 in.-gauge line between Viedma and Bariloche, and will have a top speed of 68 m.p.h.

Since the above order was placed, Ganz has received a further contract (without public tenders being called) from the Argentine Government for 38 railcars and two railcar trains. These orders comprise: four standard-gauge bogie railcars with a top speed of 95 km.p.h. (59 m.p.h.), each fitted with one Ganz–Jendrassik oil engine with a continuous output of 240 b.h.p.; 34 metre-gauge bogie railcars with four different body arrangements and each powered by a 240 b.h.p. engine; two diesel trains, each comprised of a 320 b.h.p. railcar at each end and a trailer in the middle. The two engines will be arranged for control from each driving position through electro-pneumatic remote control. The seating capacity per train is to be 156; air-conditioning will be incorporated; and the top speed will be 100 km.p.h. (62 m.p.h.). All the above vehicles are to have four-speed Ganz mechanical transmission, and in addition to the trains, 30 of the 34 metre-gauge single-unit railcars are to be fitted with electro-pneumatic remote control.

The Central Argentine Railway also has placed an order with Ganz, for 12 articulated train sets, each composed of two 5 ft. 6 in.-gauge cars. Each rake will be powered by Ganz-Jendrassik engines, and will have five-speed gearboxes giving a maximum track speed of 75 m.p.h. Two of the train sets are intended for the Rosario-Belle Ville line and will have two 320 b.h.p. engines, 24 first class seats and 117 second class seats. The ten remaining sets will be used on the Retiro-Zarate and Retiro-Capilla lines; they are to be powered by two 240 b.h.p. engines and will have 40 first class and 97 second class seats.

The Uruguayan State Railways also have placed orders with Ganz for standard-gauge diesel vehicles, viz., 10 single-unit cars and five twin articulated sets. Both types are to have five-speed Ganz mechanical transmission with electro-pneumatic remote control, and will have a top speed of 100 km.p.h. (62 m.p.h.). Each railcar has a 240 b.h.p. Ganz–Jendrassik engine, and seats 84 passengers in first and second classes. The articulated rakes are to seat 64 first class and 79 third class passengers and will be powered by two 240 b.h.p. Ganz engines of the same pattern as those used in the Argentine vehicles.

EGYPTIAN RAILCARS.—We are informed by Ganz & Co. that the figure for the total mileage performed to date by the first 10 Ganz railcars of the Egyptian State Railways is 915,000 km. (570,000 miles), and not as given on page 973 of our issue of May 14. The mileage per failure thus rises to the extraordinarily good total of 101,500 km.

U.S.S.R. TOUR.—A three-weeks' tour for the study of rail, road, air, and water transport in the U.S.S.R. leaves London on July 17. The cities visited will include Leningrad, Moscow, and Kharkov. Particulars will be found on page 1135 of this issue of THE RAILWAY GAZETTE.

MORE DIESELS IN THE EAST.—The Netherlands East India State Railways are considering the adoption of railcars of about 500 b.h.p. to haul trailers up to a total train weight of 75 tons at speeds up to 60 m.p.h. The gauge is 3 ft. 6 in.

INDO-CHINA CARS.—The six 265 b.h.p. Renault double-bogie railcars, the order for which was noted in the issue of this Supplement for October 2, 1936, have been delivered to the metre-gauge lines of the Indo-China State Railways. The cars are stationed at Saigon and Hanoi.

ITALIAN CAR FOR U.S.S.R.—One of the double-engined Littorina petrol railcars has been delivered by Fiat to the U.S.S.R. railways, but differs from the standard model in being of 5-ft. gauge and by having an oil-fired boiler for the car heating. The total brake horse-power is 240.

NEW PROPELLER CAR.—The Chemin de fer du Nord is proposing to construct a twin-engined double-vehicle railcar train driven by propellers. The propellers will be turned by oil engines, but it is proposed also to use them as brakes when necessary. It is expected that speeds in excess of 200 km.p.h. (125 m.p.h.) will be possible.

NEW IRISH RAILCAR SERVICE.—The Great Northern Railway of Ireland has augmented the service on the Drogheda–Oldcastle branch by a midday return trip made by one of the 68 b.h.p. Gardner-engined railbuses with pneumatic tyres. These railbuses were built by the G.N.R.(I).

FRENCH RAILCAR EXHIBITION.—On June 5 and 6 there was held in the Gare de l'Est, Paris, an exhibition of French railcars, mainly for the benefit of the delegates to the International Railway Congress. Among the vehicles on show were a triple-car diesel train of the Nord; the Bugatti triple set and the Michelin three-bogie single-unit car of the Etat; a producer-gas car and a 320 b.h.p. De Dietrich vehicle from the Est; three different cars from the P.L.M.; and a Renault and a "standard" car from the P.O.-Midi.

NOTES AND NEWS

South American Enquiry.—The Antofagasta (Chile) and Bolivia Railway is enquiring for metre-gauge diesel railcars of about 140 b.h.p.

Harold Sinclair.—In addition to the awards recorded in our issue of May 14, notification has been received that Mr. Harold Sinclair now has been awarded the Water Arbitration Prize by the Institution of Mechanical Engineers for the best paper on fluid transmission read during the years 1935 and 1936.

Super-Chief Train.—The new stainless-steel Super-Chief train is now in service on the Atchison, Topeka & Santa Fé Railroad's Chicago-Los Angeles route, and is being hauled by the double-unit 3,600 b.h.p. diesel-electric locomotive. The new streamlined locomotive will not be completed until the end of the summer. The new train has already made a run from Los Angeles to Chicago in less than 37 hr.

Diesel Locomotive Lease.—The Chicago Rock Island & Pacific has been authorised by the Federal District Court at Chicago to lease for seven years, with the right to purchase, ten 89-ton 600 b.h.p. diesel-electric switching locomotives from the Electro-Motive Corporation. These locomotives, having a value of $700,000, will probably be used at Des Moines, Kansas City, Peoria, Rock Island, Joliet, and Chicago.

Perkins Engine Improvements.—The Perkins Leopard II engine, rated at 50 b.h.p. at 1,500 r.p.m. for railway work (described in our February 19 issue), is now being built with several improvements incorporated, including lead-bronze lining for the thrust halves of the main and big-end bearings, the inclusion of a safety device in the oil-pressure line, and new types of pistons and rings designed with the object of lengthening the cylinder life and decreasing the oil consumption.

British Locomotive Orders.—Among orders for diesel locomotives now being executed in this country is one for a 150 b.h.p. diesel-mechanical locomotive with Vulcan-Sinclair fluid coupling for the Anglo-Iranian Oil Co. Ltd., by Hudswell, Clarke & Co. Ltd.; a 120 b.h.p. locomotive by the same builder for the Bede Metal & Chemical Co. Ltd., also with a Vulcan-Sinclair fluid coupling; and two 260 b.h.p. diesel-mechanical locomotives by Andrew Barclay, Sons & Co. Ltd., which are to be powered by Beardmore engines running at 700 r.p.m. and fitted with Vulcan-Sinclair fluid couplings of the traction type.

American News.—Considerable activity in the diesel locomotive line has been evident among the small railways of the U.S.A. during the past few weeks. The Philadelphia, Bethlehem & New England Railroad has ordered one 900 and three 600 b.h.p. diesel-electric locomotives from the Electro-Motive Corporation, and one 900 b.h.p. locomotive from the American Locomotive Company. Deliveries include three 600 b.h.p. Electro-Motive and one 600 b.h.p. Alco diesel-electric locomotives to the Patapsco & Back Rivers Railroad; two 600 b.h.p. Electro-Motive and one 600 b.h.p. Alco locomotives to the South Buffalo Railroad; and one 600 b.h.p. Alco locomotive to the Steelton & Highspire Railroad.

Paris-Brussels Diesels.—After an inaugural run on May 19, the new Paris-Belgium services worked by the diesel-electric triple-car trains of the Northern Railway of France began on May 22. There is an up and down daily service from Brussels to Paris and from Liége to Paris. The up Brussels service leaves the Gare du Midi at 9.20 and arrives at Paris (Gare du Nord) at 12.20, after stopping at Mons, Aulnoye, and St. Quentin. This time of 3 hr. for the 193 miles represents an average of 64·4 m.p.h. including stops. In the reverse direction the train leaves Paris at 20.15 and arrives at Brussels at 23.15, making the same stops *en route*. The other service leaves Liége at 8.40 and arrives at the Gare du Nord at 12.25, after stopping at Huy, Namur, Charleroi, Jeumont, Maubeuge, Aulnoye, and St. Quentin, and the time of 3 hr. 45 min. gives an average of 60·8 m.p.h. inclusive of the seven stops. In the down direction the train leaves Paris at 20.10 and arrives in Liége at 24.00, giving an average speed of 59·1 m.p.h. including the same stops.

Mexican Railcar.—The National Railways of Mexico have acquired a double-bogie railcar for the 3-ft. gauge lines. It is powered by a 118 b.h.p. White petrol engine and is fitted with Mylius mechanical transmission.

British Material for Czechoslovakia.—Two Wilson epicyclic gearboxes and two Vulcan-Sinclair traction type fluid couplings to transmit the torque from engines developing 220 b.h.p. at 1,400 r.p.m. have been supplied to Ceskomoravska–Kolben-Danek for incorporation in a railcar for the Czechoslovak State Railways.

Flying Yankee Mileage.—The streamlined *Flying Yankee*, one of the 660 b.h.p. Zephyr type of train, belonging to the Boston & Maine Railroad (see issue of this Supplement for March 22, 1935), has just resumed service after being given a general overhaul at Concord shops. Before overhaul it covered 418,000 miles in two years.

Diesel Instruction Car.—With a view to helping railroads to instruct their employees in the operation of diesel-electric locomotives and railcars, the Electro-Motive Corporation has built a 73-ft. instruction car containing various auxiliaries, sections of oil engines, and with a cinema arranged to give talking films on two-stroke (Winton type) engines, train handling, and maintenance.

Swedish Extension.—The Swedish State Railways have ordered 25 light four-wheeled petrol railcars with double-end drive. These cars will be similar to those already in operation, and will have a 100 b.h.p. petrol engine and 24 seats. The weight, as before, is 6¼ metric tons, but the top speed is being increased from 80 to 90 km.p.h. (50 to 56 m.p.h.). A car of this design is being shown at the Paris Exhibition.

Diesel Streamliner Doubles Traffic.—The Chicago, Burlington & Quincy's passenger traffic on its Chicago-Twin Cities train is now more than twice what it was prior to the inauguration of its Zephyrs on April 21, 1935, according to Mr. Albert Cotsworth, Jr., passenger traffic manager. The increase during January and February was 126 per cent. over comparable months of 1935. Of these passengers, 54 per cent. timed their trips to use the Zephyrs. Since April 21, 1935, the original twin Zephyrs and the seven-car twins, which replaced them last December, have travelled 1,213,357 miles between the Twin Cities and Chicago. Since the inauguration of the Zephyr service, there has been a reversal of travel habit, a larger percentage of persons now travelling during the daytime. During the period from November, 1934, to February, 1935, 83·7 per cent. of the traffic moved at night and 16·3 per cent. during the daytime, while during the period from January 1, 1936, to April, 1937, 28·7 per cent. moved at night and 71·3 per cent. during the daytime.